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ABSTRACT

Through direct experience within natural settings, outdoor education allows students to learn about environmental concerns such as migration of birds, weather systems, wildlife habitats, watersheds, soil erosion, geological formations, food chains, and community resources. All subject areas in the present curriculum can be enriched through outdoor education experiences, and more importantly, subject areas become related, integrated, and enhanced. The introduction contains an outline of procedures in the establishment of an outdoor classroom, including site selection, site design, and a site inventory checklist. Ten model lessons with activities are described, with each lesson containing: a list of objectives, an inventory of related curriculum areas, an enumeration of required teacher background skills, several suggestions for 10-minute activities with questions to guide observations, a catalog of ongoing activities requiring extended visits, a record of suitable expansions to the lesson with related activities, and a short vocabulary. The ten model lesson domains are: (1) discovering local wildlife; (2) learning about apples; (3) gathering information about birds; (4) facts about plants; (5) examination of rocks; (6) learning about soil; (7) understanding water habitats; (8) experiences with trees; (9) awareness of the water cycle; and (10) weather observations and predictions. The last section contains an extensive list of both curriculum and program resources. (JJK)

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Dear Teachers:

The Department of Education appreciates the support of the many natural resource agencies and classroom teachers who assisted in the preparation of The Outdoor Classroom.

Our goal is to make learning more meaningful and more enjoyable as children learn an appreciation of the many components of the world in which they live.

You are invited to use these activities in your classroom and to share with us your suggestions, ideas, and resources that might improve any of the lessons. We hope the thematic and interdisciplinary activities contained in this publication encourage you to explore and discover with your students in the outdoor classroom.

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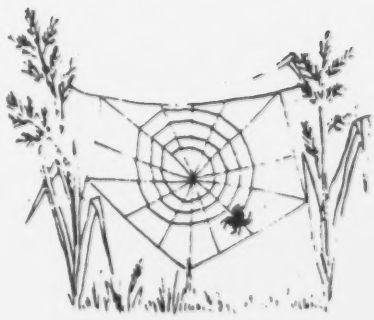
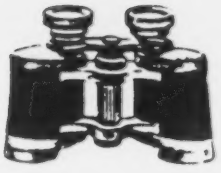


THE OUTDOOR CLASSROOM

Experiencing Nature
In the Elementary Curriculum



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INTRODUCTION

The outdoor lessons, concepts, and experiences in this program are designed to encourage teachers to utilize school sites, communities, parks, forests, rivers, ponds, wildlife areas, watersheds, and nature centers to design an in-depth outdoor education teaching plan to enrich the school curriculum. Through these direct experiences, students will learn about migration of birds, weather systems, wildlife habitats, watersheds, soil erosion, geological formations, food chains, forestry resources, plants, harvesting crops, and community resources. These experiences will help each student better understand and develop a caring attitude about how people affect the natural world.

Outdoor education is not another subject to be added to the curriculum. It is a tool that integrates many subject areas as students explore, discover, and investigate their environment. It teaches the world together, rather than in small pieces. It provides students with the knowledge and skills required when making wise decisions about the natural world.

The ideas and activities in these teaching materials will come to life when the teacher has tried them, modified them, and improved them to fit the needs of the students. These materials are presented to encourage teachers to get started in expanding their classrooms to include the outdoors. Students should have the opportunity to "experience" Indiana, and the world. A thousand experiences await each student in the outdoor classroom. Remember, one good experience can change a child's attitude about learning; one special teacher can make that experience possible!

WHAT IS OUTDOOR EDUCATION?

Outdoor education is a method of teaching. It involves intelligent planning by all teachers using natural resources and real life experiences to teach concepts which can best be taught in an outdoor classroom.

All subject areas in the present day curriculum can be enriched through outdoor education experiences. More importantly, subject areas become related and integrated when students and staff investigate, interpret, explore, manage, and make decisions about natural resources. Teaching outdoors also reinforces and enhances many of the concepts taught indoors.

To integrate outdoor education into the curriculum, each discipline must be carefully studied to discover how and when a direct learning experience will make it more meaningful. The

outdoor learning experience should be supported with adequate reading materials, textbooks, and classroom lessons. Other available aids to learning include films, slides, resource visitors, and supportive field equipment.

Outdoor education involves:

- using critical thinking skills
- learning through direct experiences
- exploring
- decision making
- managing natural resources
- real-life encounters
- using the senses to discover and observe

Follow-up activities in the regular classroom make up an important component. After visiting, exploring, discovering, and investigating in the outdoor classroom, students will be excited. The teacher should take advantage of this excitement by asking them to share their observations and experiences. Inquisitive students will want to learn more about their discoveries, findings, experiments, and investigations. Facilitate their inquisitiveness by guiding them to enriching books, magazines, films, and other resources. Challenge them to read and research, experiment and document, estimate and prepare reports, construct and create, observe and sketch, imagine and write. Guide them in searching for meanings of new words and data about weather, soils, fossils, trees, plants, and animals.

WHAT IS AN OUTDOOR CLASSROOM?

All schools in Indiana have outdoor classrooms. They have no boundaries or walls. The outdoor classroom should begin with the school site. The school site is convenient, available for short periods of time, and can be used consistently. Special preparations required for off-site field trips, such as transportation, can be eliminated. On-site activities allow students to have hands-on experiences necessary to understand important concepts. Outdoor classrooms can extend into the community where parks, forests, creeks, rivers, lakes, streets, museums, water and sewage treatment facilities, and nature centers can become an integral part of the outdoor education program.

OUTDOOR EDUCATION TRENDS

Outdoor education and classrooms are popular in Indiana. Several school districts have purchased additional property and established interdisciplinary outdoor programs. For example, Marion Community Schools own and manage ASHERWOODS, a 120 acre outdoor classroom. Gary Community School Corporation owns and manages the Deep River Outdoor Education Center, 80 acres with

buildings and a lake. Prairie Heights Community School Corporation owns and manages a 180 acre outdoor classroom, and MSD of Southwest Allen County owns and manages an outdoor classroom with a lake, pond, wildlife area, forest, marsh, and a new (log cabin) environmental center. Approximately 100 classrooms are operational and plans are underway to develop more. Sizes range from one-fourth to 200 acres.

OUTDOOR CLASSROOMS AWAY FROM SCHOOL PROPERTY

Several school districts utilize city and state parks, arboretums, nature centers, forests, wildlife areas, nature preserves, wilderness areas, rivers, lakes, mountains, farms, ponds, streams, and communities as outdoor classrooms. National and state natural resource agencies have organized curricular materials, in-service training, consultant services, and graduate credit classes to aid K-12 educators and administrators in integrating important natural concepts into the curriculum. Two outstanding programs, "Project Learning Tree" and "Project WILD," are available free to all elementary and secondary teachers in Indiana (see resource section).

RESIDENT OUTDOOR EDUCATION EXPERIENCES

In addition to daily experiences encountered in a local outdoor classroom, many schools have designed camping programs for students. Through resident outdoor programs, students, teachers, and parents live and learn together in a natural environment for three to five days. Over 100 elementary schools are already participating, and a trend is underway for others to develop in the near future.

For example, Nicholson Elementary School fifth graders, teaching staff, parents, and Crawfordsville community volunteers, travel to McCormicks Creek State Park each spring for three days and two nights to study rocks, plants, soil, wildlife, water, weather, and ecology.

Indianapolis Public Schools involve sixth graders in a five-day innovative and nationally recognized exemplary camping program at the FFA Camp near Trafalgar.

DESIGNING OUTDOOR CLASSROOMS

A committee of interested teachers, students, administrators, parents, and representatives from the community can plan the outdoor classroom more effectively than one individual. This committee approach helps insure that the program continues in case one or more individuals should leave the school. A committee also carries more influence than one individual. More importantly, each individual will bring innovative and exciting

ideas, resources, and support to the planning and implementation sessions.

PROCEDURE OUTLINE FOR OUTDOOR CLASSROOM

1. Establish an Outdoor Classroom Committee. Select key working staff members, key administrators and local resource people to establish a development policy in line with the education philosophy of the school. Delegate authority, set goals, secure administrative sanction and support.

2. Material. Collect resource and research material about outdoor education and set up a working file and resource area. Keep records of photographs, reports, clippings, guides, lessons, and research findings.

3. Resource people. Involve resource people, parents and groups who believe in and support the plan (sportsmen's clubs, women's clubs, Cooperative Extension agents, parent organizations).

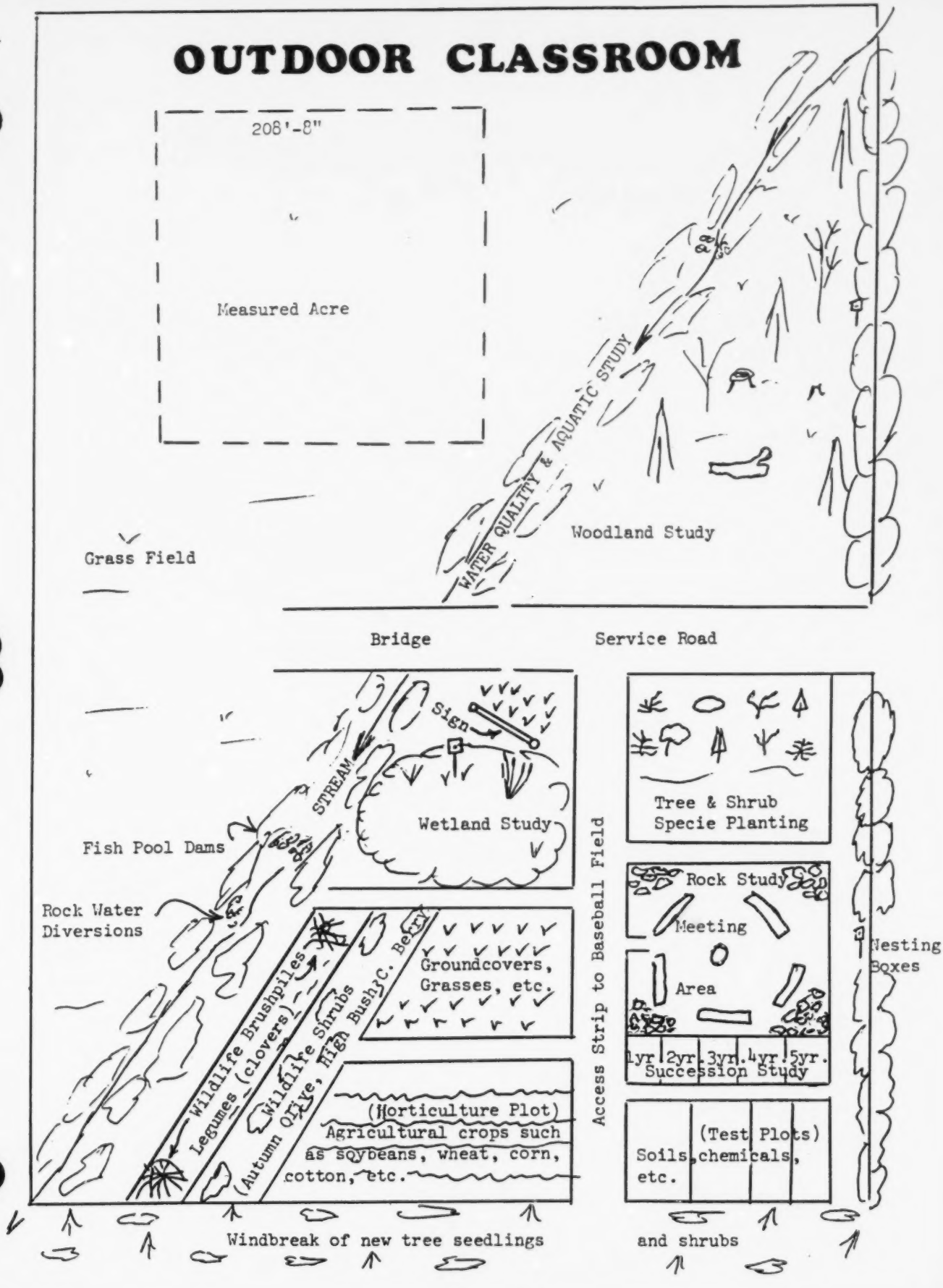
4. Join the local Soil and Water Conservation District (SWCD). This costs no money and places your land under no obligation. It does enable the SWCD to offer technical assistance and the aid of local District resources. The SWCD will provide a land-use plan, soil map, access to outdoor education material, and an aerial photo (extra large sized can be obtained).

5. Map and inventory your entire site and any land that may come into school ownership in the future. Record contour lines, cover types and distribution, drainage, ponds, rock outcroppings, swales, and base features (roads, fences, buildings, etc).

6. Prepare a plan. A detailed step-by-step plan is essential for the orderly development of the school site. Duties should be spelled out, budgets established, and educational specifications drawn up for the plan. The plan should be presented to the local school board for approval.

7. Promote and publicize. Publicity will help sell the "new concept" to those who resist because they are not informed. It will also lure helpful volunteers and resource people.

OUTDOOR CLASSROOM



SITE INVENTORY CHECKLIST

Excellent learning activities can be designed around many natural and man-made parts of the school grounds. Take some time to walk around the school property and notice the diversity. There may be grassy areas, paved surfaces, bare soil, trees, shrubby fence rows, wet marshy areas, creeks, rocks, fossils embedded in the limestone facing of the school building, and wildlife habitats. Use the following checklist to inventory existing and potential study features on the site.

___Air	___Fish	___Rotten logs
___Animals	___Flowers	___Sand
___Animal tracks	___Fossils	___Scenic Spot
___Animal homes	___Geometric shapes	___Seeds
___Aquatic plants	___Grassy areas	___Silt
___Area for Garden	___Historical areas	___Smells
___Area for Weather Station	___Historical findings	___Soil
___Berry producing Shrubs	___Insects	___Stumps
___Bricks	___Litter	___Underground water
___Brushy fence rows	___Machines	___Vines
___Clay	___Marshy areas	___Watershed
___Colors	___Microorganisms	___Weeds
___Clouds	___Oldest thing	___Wildlife habitats
___Coniferous plants	___Plants for food and cover	___Wildlife travel lanes
___Creek	___Plant succession	___Wind
___Deciduous plants	___Pollution	___Windbreaks
___Decomposers	___Pond	___Youngest thing
___Den trees	___Rocks	
___Drains	___Roots	
___Erosion		

MODEL OUTDOOR EDUCATION ACTIVITIES AND LESSONS

A variety of outdoor lessons and activities are provided in this guide to assist teachers in developing outdoor education programs. Most of the lessons begin inside the school building and proceed to outdoor experiences. The K-6 lessons focus on science while integrating several other subject areas. Each lesson can be adapted to meet the needs of all elementary grade levels including special education students.

Each lesson includes objectives and a series of instructional activities designed to lead the students to the behavior stated

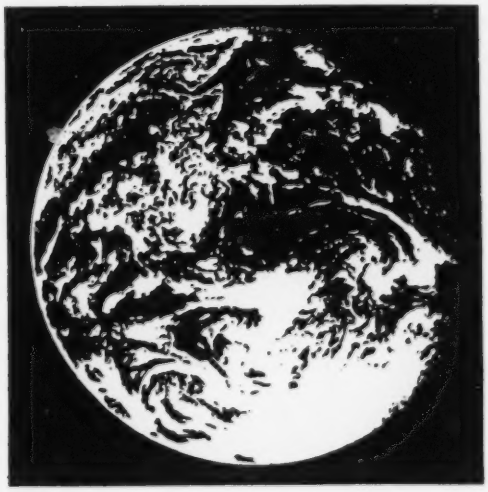
in the objectives. The lessons are supported by a list of resources (resource section) which compliment the activities and some background information helpful for teacher preparation.

Both short- and long-term activities are included in all lessons. Each teacher will be able to select those that are appropriate for the individual class and that will fit into the available time. If time is not available for a series of lessons, a teacher might want to select segments from several different lessons to do one "nature" lesson.

Ten-minute outdoor experiences have been planned to use with the units. These outdoor experiences are designed to help students observe and interpret trees, soil, water resources, animal habitats, and weather systems. Good questioning strategies can help the teacher pull important concepts from students observed during their outdoor investigations.

The objectives and activities in the lessons are correlated with the Indiana Curriculum Proficiency Guide, which emphasizes the process of learning through direct experience. An important emphasis is the development of a citizenry which is knowledgeable about the natural world and which places value on plants and animals.

Action to conserve the remaining natural environment will require a sense of responsibility on the part of every American citizen. Unthinking people pollute the environment. Thinking people can affect a new environmentalism dedicated to restoring, as well as protecting; bringing beauty to the cities, as well as the countryside; halting the massive deterioration of the environment, as well as managing resources; and maintaining values that are essential for the survival of plants, animals, and humans on Planet Earth.



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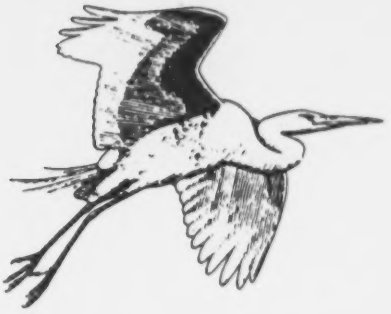


DISCOVERING WILDLIFE ON SPACESHIP EARTH
K-6

OBJECTIVES:

1. Students will list the basic characteristics of animals.
2. Students will describe how two animals are alike and how they are different.
3. Students will identify five animals that live on their school site and in the community.
4. Students will recognize signs of animals on the school site and in the community.
5. Students will identify animals' basic needs such as food, shelter, air, and water.
6. Students will construct a food chain for one of the animals living on the school site or in the community.

CURRICULAR AREAS:

Art, Health, Language Arts, Music, Science, and Social Studies.

TEACHER BACKGROUND

The study of animals can add excitement, relevancy, and direct experiences to the school curriculum. Animals such as squirrels, chipmunks, spiders, toads, and rabbits can be found on most school sites or in local communities. A study of these animals can get students directly involved in observing, researching, sketching, photographing, recording, managing, protecting, and writing.

Important concepts such as adaptation, food chains, habitats, producers, consumers, and decomposers can be introduced to students. Students will learn to use observation skills to learn how animals are able to survive in a natural environment. They will also learn how animals hibernate during winter months in order to survive cold weather.

Students will learn that animals depend on plants for food, shelter, and oxygen. They will discover that all life is delicately connected and balanced through an interdependent chain of life supporting resources - air, water, sunlight, minerals, plants, energy, soil, and animals.

As students explore and investigate animal life they will learn that many are endangered species. This means they could disappear from the earth forever. Students will understand that people can destroy animals by removing trees, grass, shrubs, water and other survival resources such as soil, air and plants. They will also see that people can live in harmony with wild animals. They will learn that we are all passengers on Spaceship Earth.

Coordinate your activities with the school librarian. Find out what books, posters, photographs, films and other resources are available. Build on student interest by guiding each one to an exciting book about animals. Have your students write creative and imaginative stories. Have them write poems about their experiences. Have them sketch a favorite animal. Have them keep scientific journals where they can record important data about animals. Have them interview wildlife specialists and prepare reports about their findings.

TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activities:

1. Within a ten minute interval, find and record the location of as many animals or animal signs as possible.
2. Classify each animal found into broad animal groups (i.e. mammal, bird, insect).

Questions to guide observation and learning:

1. Where did you find animals or animal signs (habitat)?
2. Why do we see only certain animals or animal signs?
3. What do you notice about their colors? How does this help them (adapt, protection, etc.)?
4. What do you think the animal eats? What might eat it (food chain)? How do you know this?
5. How does this animal help the environment? What would happen if this animal would disappear from the Earth (become extinct)?

ACTIVITIES:

1. List the animals they have seen on the school site or in the community. Have each student list:
   a. animals they have seen
   b. where they saw the animals
   c. time of year
   d. color of animal(s)
   e. where they think animal(s) live.

2. Visit school site to have students observe, investigate and record:
   a. animals
   b. animal signs
   c. animal habitats
   d. resources that animals need
   e. food animals eat.

3. Select an animal and research what it eats, where it lives, its color(s), and what happens to it in the winter. Prepare to report signigicant findings to the class. Ask the librarian to assist you.

4. Select an animal and write a poem describing it.

5. Write a creative story describing a day in the life of their animals.

6. Sketch or describe their animals.

7. Compare the colors, size, jaws, legs and teeth of one animal to another and record differences.

8. Research and record how animals are similar to and different from people. Ask them to find out:
   a. how their homes differ
   b. what dangers animals have that people do not have
   c. how animals and people prepare (adapt) for cold and warm weather
   d. the resources both animals and people need in order to live
   e. how animals and people take care of their young.

9. Invite a wildlife specialist to your school. Prepare students to interview by having each one compose a question.

10. Role play animals eating, running, playing, and sleeping.

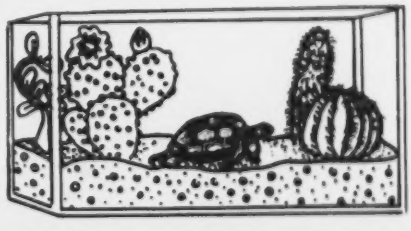
11. Select a series of animal songs and have students plan a dramatic production for their songs.

12. Research and list animals found in state and national forests, wildlife areas, and wilderness areas.

13. Contact the Indiana Department of Natural Resources (IDNR) to ask about (see resource list):
   a. deer management programs
   b. wild turkey management programs
   c. rabbit and squirrel hunting season
   d. fishing programs.

14. Investigate IDNR game management programs and report significant findings, concerns and recommendations to class.

15. Debate whether or not there should be a hunting and fishing season for deer, wild turkey, rabbits, squirrels and fish.



EXTENSIONS:

1. Develop wildlife habitats on the school site for animals and birds (wildlife plantings, feeding stations, water stations, trees, grasses, and rocks).

2. Design a class play depicting how animals depend on trees, water, soil, plants, food, sun, and the air. Present play to students and parents.

3. Select an endangered species animal (Wolves, Whales, Grizzly Bear) and plan a program to help prevent it from becoming extinct.

4. Write to Indiana Department of Natural Resources for copies of:
   a. The Bald Eagle in Indiana.
   b. Barred Owls in Indiana.
   Present these programs to class.

5. Plan a Take Pride in America (TPIA) program to help conserve wildlife by protecting and restoring soils, trees, plants, rocks, wildlife, and water resources on your school site (see resource list).

VOCABULARY

Habitat - home for animals.

Adapt - how animals change to survive in an environment (colors, movement, body parts).

Food Chain - an arrangement of animals according to the order they will be eaten by other animals.

Extinct - no longer exists.

Producers - an organism (green plant) which produces its own energy source and serves as a food source for other organisms.

Consumer - an organism requiring food which it obtains by preying on other organisms.

Hibernate - to become inactive or dormant.

JOHNNY APPLESEED
K-6

OBJECTIVES:

1. Students will make sensual observations of color, texture, shape, size, and odor of apple. Using assorted varieties of apples will allow them to make comparison observations.
2. Students will identify the various parts of an apple and apple seed.
3. Students will name the natural resources needed to grow apples trees and explain management practices required to produce healthy trees.
4. Students will name at least three kinds of apples grown in Indiana and the best use for each kind.
5. Students will explain how Johnny Appleseed contributed to the growth of apples in Indiana.
6. Students will identify the nutritional value of apples.
7. Students will make apple butter, cider, or sauce as a class project.
8. Students will explain how apple trees collect sunlight, water, minerals, and CO2 to make energy (Photosynthesis).
9. Students will discuss the economic values of apple trees and orchards.

CURRICULAR AREAS:

Art, economics, language arts, mathematics, health, science, social studies.

TEACHER BACKGROUND:

Apples are a delicious and nutritious fruit that appeal to almost everyone. A juicy red or gold apple is a favorite for snacks and in lunch boxes. Indiana produces a variety of apples and apple products. An average year in Indiana will result in about 1.5 million bushels of apples. The apple's infinite varieties include Rome Beauty, Jonathan, Red and Golden Delicious, Grimes Golden, Turley, Stayman, Transparent, Portland, and McIntosh. Although different varieties are harvested throughout the summer, autumn is the traditional time and an excellent time to use this juicy favorite.

Thanks to Johnny Appleseed, apple orchards can be found in almost every community in the state. His real name was John Chapman. He was born in Leominster, Massachusetts in 1775. Before he died in Fort Wayne in 1845, he had wandered throughout Indiana and Ohio planting apple seeds. He has been described as a barefoot hero of the Ohio and Indiana backwoods and a pioneer tree-planter of the 19th century, whose labors bore fruit over 1,000 square miles of territory. He believed God appointed him to a mission in the wilderness to preach the gospel of love and plant apple nurseries that would produce orchards for the pioneers.

Long ago on a fine spring day
Johnny Appleseed came this way
And over hill and meadowland
Scattered his seeds with lavish hand
Here are Jonathan, Bellflower, Northern Spy,
Apples for baking, apples for pie,
Rhode Island Greening, Maidenblush,
Winesap, Pippin, McIntosh,
Russet, Ben Davis, Grimes Yellow Gold,
Rambo and Baldwin to store in the cold,
Rich apple butter and cider for all,
Transparent jelly from apples that fall.
Apples are gathered in orchards today
For Johnny Appleseed came this way.

Mary Ferguson Legler

The apple became as important as pigs and corn, since it provided a versatile, nutritious food. It added variety to the settlers' diets the year around, depending upon whether it was served fresh, cooked, or dried. It was also made into pies, cider, vinegar, and apple jack. Apples are good salted or spread with peanut butter, and few things are better than a caramel apple. Dried apples were used during winter months to make pies and cobblers. Apples are a natural nutritional source, providing fiber and pectin to the diet, which aid digestion. They are fat-free and contain minerals such as calcium, phosphorus, iron, iodine, sodium, and potassium. They also provide vitamins A, B1, B2, and niacin. What natural resources are needed to produce apples? How do apples form seeds? What nutritional value do apples have? How are apple trees managed to make them more productive and healthy? The answers to these questions can be found in your library, community and state. Have your students assume responsibility for researching answers to these questions.

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TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

1. Have students visit outdoor classroom for ten minutes to observe and collect seeds.

Questions to Guide Observation and Learning:

1. What kinds of seeds did you find?
2. Where do you think they came from?
3. What do you think will happen to the seeds?
4. What do seeds need to grow?

ACTIVITIES:

1. Research and prepare written reports on the values and uses of varieties of apples such as Jonathan, McIntosh, Red and Yellow Delicious, Rome, Wine Sap, and Granny Smith. Have students eat part of an apple and discuss its nutritional value.

2. Bring apples to class and cut them into pieces. Discuss the various parts of an apple. Cut them across and lengthwise, see the star when cut across. Have students save their apple seeds. Discuss the various parts of an apple seed.

3. Research possibilities and results if the seeds were planted.

   a. What resources will the seed need to make it grow?
   b. If the seed grows, what might they see? How long will it take? How can we find out?
   c. How long should seeds be cooled or dried for germination to take place?

4. Plant the seeds in a container and observe them daily in the classroom.

   a. Have students keep science records.
   b. When did the first seed develop into a plant?
   c. What does it take for the plant to grow?
   d. What would happen to the plant if one resource was removed?
   e. What would happen if the plant was placed in a larger container?

5. Research and prepare written reports on the history of Johnny Appleseed.

   a. Did he really exist?
   b. Did he visit Indiana?

c. What was his message to the people?
d. When did he live? Where is he buried?
e. What states did he visit? How did he travel?
f. Celebrate Johnny's birthday, September 26.

6. Bring five or six apple products to class.

a. Have students determine where the products were produced.
b. Have students determine the additives found in each product.
c. Discuss the role of additives in processing foods.
d. Have students list the kinds of energy used to prepare and ship apple products.
e. Discuss how consumers can shop more effectively and energy efficiently for products.

7. Take a field trip to a local orchard. Take <u>parents</u> along to help supervise.

a. What kinds of apples are grown there?
b. What management practices are required to produce the apples?
c. How many people are employed?
d. Where are the apples shipped?
e. How nutritious are apples? What minerals and vitamins are found in them?
f. How is apple cider made?

8. Make apple butter or cider; or, invite <u>senior citizens</u>, parents, grandparents from your community to visit the class to teach or demonstrate how to make:

apple pie	apple cakes
apple butter	fried apples
apple cider	taffy apples
apple sauce	

Wear gloves when cooking apples. After making the food, lead a discussion on the changing properties of the apple during cooking, noting ways the products are similar and ways they differ from new apples.

9. Discuss the economic impact of apples in your community.

10. Organize an APPLE DAY for your school. Ask room mothers to help supervise.

a. Have students plan presentations for other classes.
b. Invite senior citizens and orchard owners to set up displays/demonstrations in school.
c. Assist students in organizing a Johnny Appleseed play for the school.

d) Invite speaker(s) from Indiana Department of Commerce and from the community to make presentations on apples to students.
e) Plan an Apple Parade for your school and community.
f) Sponsor an Apple Day art program.
g) Plan pioneer games and activities (apple dunking, making apple butter, making apple pancakes) for your school.

EXTENSIONS:

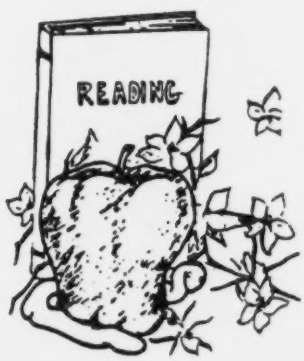
1. Extend studies to include recycling (Johnny recycled many things in order to survive). Energy resources could be introduced. Start a recycling program.

2. Plant herbs in a herb garden. Research herbs before you plant them to determine nutritional and medicinal values. Johnny Appleseed helped heal animals and people from herbs gathered in the woods.

3. Plant and manage a school orchard. Have students plant their apple trees outside in a designated area. Prior to planting discuss preparation needed before planting trees outside, and the time of the year that is best for planting trees. Have students keep daily science records recording temperatures, weather factors, soil type(s), and growth patterns.

VOCABULARY:

Seed	- the fertilized ripened ovule of a plant containing an embryo and capable of producing a new plant.
Nutrition	- the process by which people take in and utilize food.
Orchard	- a planting of fruit or nut trees.
Apple	- the fleshy rounded red or yellow edible fruit of a tree.
Fruit	- edible reproductive body of a seed plant.



OUR FEATHERED FRIENDS
K-6

OBJECTIVES:

1. Students will identify and list five birds in their school community.
2. Students will identify ways birds benefit people and communities.
3. Students will identify natural resources birds need for survival.
4. Students will identify four bird habitats.
5. Students will be able to describe five characteristics of a particular bird (i.e. shape, color, wings, bill, legs, crest, breast).
6. Students will list three wildlife practices which can attract birds to the school site.
7. Students will learn how birds survive cold winters by migration and altered eating patterns.

CURRICULAR AREAS:

Art, Health, Language Arts, Math, Music, Science, and Social Studies

TEACHER BACKGROUND:

Birds play an important part in helping control insect and rodent populations in Indiana. Without them agricultural crops would be damaged. For example, a House Wren feeds 500 insects to its young every day, a Brown Thrasher may eat over 6,000 insects in one day and a Swallow devours 1,000 insects every 12 hours. Birds are warm-blooded animals with a backbone, two feet, wings, and covered with feathers. Birds lay eggs. They have three essential needs - food, shelter, and water.

As we change the land, we must guard against destroying homes (habitats) for birds. Birds can learn to adapt to the presence of people if sufficient water, natural areas, and food are made available. Birds also serve as environmental indicators. When they start declining in population, this suggests certain natural resources may be polluted or have disappeared.

Birds are fascinating creatures to study and observe. Some birds such as Chimney Swifts migrate thousands of miles in the fall to other countries (Central America) where they spend the winter. They migrate back in spring to the same chimney in Indiana they left several months ago. Here they build their nests, lay their eggs, and new Chimney Swifts are born. Chimney Swifts eat thousands of insects which helps to maintain a balance in natural systems. They play a very important role in our environment.

Although some birds migrate a few miles to find food and warmer climates, others leave their Midwest nesting sites and fly nonstop for up to 3,000 miles or up to 10 hours. These birds usually eat extra food to build up layers of fat (fuel) to sustain them during the long flight. These birds then leave their wintering place in Central America or South America and come back north, often to the same place, the same tree limb, and even the same nest.

Some of the birds have amazing time clocks. As the days shorten or lengthen, they become restless. Many travel at night, guided by the stars. Day travelers are guided by the mountains, rivers, and the sun, using the same route every year. The most famous are the swallows who return to San Juan Capistrano, California, within the same few days each year. Many people wait for them and a song was even written about them.

Although many scientists study the migrating birds, they cannot unlock the mysteries of how or why they go so far and return to the same place every year. Other birds "stay at home"; for example, the Cardinal and th Bobwhite usually live their entire lives within 10 miles of their birthplaces.

The Indiana Department of Natural Resources (IDNR) protects many birds. It is illegal to kill Hawks, Owls, and Eagles in Indiana. These predator (meat eating) birds eat rats, mice, and other rodents. They save Indiana farmers thousands of dollars by eating rodents who eat the farmers' corn, soybeans, and wheat. IDNR is attempting to attract Bald Eagles back to Indiana. Research is presently being done to reintroduce this giant predator. See the resource section for programs about the Bald Eagle and Barred Owl.

IDNR also provides special habitats for thousands of birds. Fifteen areas have been established in Indiana for wildlife management and protection. Thirteen state forests also provide food, shelter, and protection for birds and other animals.

In addition, 19 state parks provide habitats and protection for a variety of birds. Nine state reservoirs provide special habitats for water fowl. IDNR is strongly committed to protecting and managing birds that live in, or are migrating through, Indiana.

The school site is an excellent place to begin observing and studying birds. Cardinals, English Sparrows, Robins, Blue Jays, Starlings, Woodpeckers, Doves, and a variety of other birds can be observed on school sites or in most communities. The National Audubon Society (NAS) specializes in the study and preservation of birds. NAS has exciting magazines, materials, posters, picture slides, and programs for schools. There may be an Audubon Chapter near your school. This environmental organization is always willing to assist teachers with a bird unit. (See resource section.)

Some of the common Indiana birds that your students may already be familiar with are listed with brief descriptions.

Bluebird - a small songbird of North America that has blue back and wings.

Bluejay - a bird with a blue back and a crest of feathers on its head. It has a loud, rough call. Jays live year-round in Indiana.

Bobwhite - a small North American quail with brown and white markings on a gray body. Its name comes from its call.

Crow - a large black bird known for its harsh cry or caw.

Cardinal - an American songbird that is bright red and has a black face. This is the state bird of Indiana and several other states.

Robin - a large thrush of North America with a dull-red breast.

Baltimore Oriole - a black and orange songbird of North America.

Sparrow - a small gray and brown songbird with a short beak. The common sparrow seen on city streets is the English sparrow. It eats mostly weed seeds and harmful insects.

Red-winged Blackbird - a North American blackbird. The male is black with a patch of scarlet at the bend of the wings. They nest in low brush and are easily observed.

Mockingbird - songbird of United States that imitates the calls of other birds. It is a large gray bird with white wing patches and eats fruits and berries.

Woodpecker - a bird having a strong, pointed bill, with which it pecks holes in bark to get insects. The red-headed woodpecker is often seen during Indiana summers.

TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity

1. Take a ten minute trip to the outdoor classroom and have students observe and list birds and bird signs they find.

Questions to Guide Observation and Learning:

1. What birds did you find?
2. What bird signs did you find?
3. How do birds help the environment?
4. What resources do birds need to live?

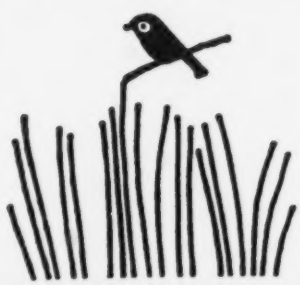
ACTIVITIES:

1. Invite a bird specialist from the community to visit class. Interview the specialist about a specific bird's:
   a. Nesting requirements
   b. Food chains
   c. Habitat (home)
   d. Migration habits
   e. Benefits to people
   f. Reasons for colors
   g. Bird songs and reasons.

2. Research a bird common to Indiana. Good choices include the English Sparrow, Robin, Starling, Cardinal, and Hawk. Report on:
   a. Habitat(s)
   b. Nesting habits
   c. Migration
   d. Food eaten
   e. Benefits to people
   f. Benefits to environment
   g. Songs
   h. Eggs - color, number, and hatching time.

3. Sketch and color a bird common to the community and state. Describe characteristics of the bird. The art teacher may want to make this a class lesson with all students drawing a chosen species.

4. Take a trip around the school site. Report observations:
   a. Birds you saw
   b. Bird food you saw



c. Bird signs you found
d. Where birds find water
e. Sounds birds make (use tape recorder)
f. Nests and habitats.

5. Construct a feeding station. Record:
   a. Birds that come to station
   b. Amounts and types of food they eat
   c. Time of day they eat
   d. Any unusual activities (squirrels and chipmunks visiting stations, unusual birds visiting stations, etc.).

6. Research how birds benefit people and the environment. Write reports on the findings.

7. Research birds which live near the water.
   a. How are they adapted for the water?
   b. How are they different than woodland birds?
   c. What do they eat?
   d. Where do they eat?
   e. What kinds of habitats do these birds require?

8. Research birds which live in a woodland environment to determine:
   a. How they are adapted for living in the forest - color, talons, bill, etc.
   b. Special characteristics which help them survive
   c. Their functions in natural food chains
   d. How they are able to survive in the winter
   e. How they benefit people and natural systems

9. Design bird bulletin boards and displays for classroom, school, and community. If the class designed a four season mural in the trees' lesson, they may want to add birds, nests, and feeding stations to the mural in the appropriate seasons.

10. Research birds that are classified as endangered species to determine:
    a. What caused this?
    b. What can be done to prevent this?
    c. What you can do?
    d. Effects of Bald Eagle or Whooping Crane becoming extinct.
    e. Effects of state and federal legislation protecting Hawks, Owls, Eagles, and other birds.

11. Collect feathers from a variety of wild and domestic birds (Peacocks, Owls, Pheasants, Hawks, Cardinals, Grouse, etc.) and construct a feather display. Examine shafts to determine if a feather is a flight, a tail, or a down feather.

12. Have students ask parents to help think of songs about birds and make a list for class (i.e. "Bluebird of Happiness," "Woody Woodpecker Song," "Red, Red, Robin," "When the Swallows Come Back to Capistrano"). Ask music teacher to teach a bird song to class. Discuss why birds are so popular with writers.

EXTENSIONS

1. Design a Wildlife Bird Habitat for the school. Set aside an area to grow sunflowers, blackberries, elderberries, Autumn Olive, Crabapple, Hawthorne, Beech, Red Oak, White Oak, White Pine, and/or White Spruce trees. Write to the National Wildlife Federation for a copy of Invite Wildlife to Your Backyard.

   Contact the local Soil and Water Conservation District or Department of Natural Resources for information about wildlife packets and trees.

2. Design a natural observation, sound recording, and photography blind. Teach students how to properly use binoculars to observe birds, or invite resource person from community to demonstrate this. The blind can be used to observe:
   a. Feeding habits
   b. Flight patterns
   c. Colors and songs
   d. Features
   e. Habitat requirements
   f. Nesting habits.

3. Take a field trip to Jasper-Pulaski Wildlife area to observe the annual migration of Sandhill Cranes (over 15,000 will stay overnight on their way to Florida), or visit a nearby wildlife area to observe birds migrating.

4. Incubate pheasant, duck, or chicken eggs. Make sure you have a place for the birds after they hatch.

VOCABULARY

Habitat	- home for animals.
Migration	- animals moving from one place to another.
Food Chain	- an arrangement of animals according to the predator order they use (eat) each other.

Wildlife	- animals that are part of a natural system (mammals, bird and fish).
Predator Birds	- meat eating birds.
Bird	- warm blooded animals with a backbone, two feet, wings, and covered with feathers.

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PLANTS: MIRACLES IN NATURE
K-6

OBJECTIVES:

1. Students will use the five senses to observe and investigate plants.
2. Students will explain the importance of plants in a natural environment.
3. Students will explain how plants benefit people.
4. Students will research the nutritional value of plants.
5. Students will conduct experiments to determine the effects moisture, sunlight, air, and soil have on plants.
6. Students will construct a terrarium.
7. Students will observe the structures of roots, stems, flowers, and the growth of seeds and bulbs.
8. Students will identify five domestic and/or wild flowers.

CURRICULAR AREAS:

Art, Health, Language Arts, Mathematics, Music, Science, and Social Studies

TEACHER BACKGROUND:

Plants play a very important part in our environment. They provide us food, medicine, oxygen, energy, and beauty. Their roots help stabilize and hold the top soil in place. When plants die they decompose and enrich the soil with minerals. They also help collect and store water so that animals and people can have water to drink and use. Without plants, all life on Earth would end. Even meat eating animals (carnivores) such as wolves and lions would die. Without plants, the plant eating animals (herbivores) would die (become extinct) and carnivores would have nothing to eat.

Plants are miracles. They are the only living organisms that can collect and store the sun's energy (photosynthesis). Through this scientific process, plants directly or indirectly provide energy for all animals and people. Most of the energy people use for transportation, work, heating, and cooling homes and businesses comes from plants that lived millions of years

ago. The plants died, were covered by soil, and over a period of time turned into natural gas and coal. These fossil fuels provide for most of our energy needs today. For example, over 95 percent of Indiana's electricity comes from coal.

Plants are everywhere. You will even find them growing in cracks in sidewalks. Trees are also plants. They are large solar(sun) collectors. Take a trip to your outdoor classroom to observe plants growing there. You will be amazed to see where they grow. Notice how most of them climb toward the sun. They are reaching out to capture the sun's energy. Observe their colors. The green you see (chlorophyll) is the energy the plant has made by collecting the sun's energy, water, minerals, and carbon dioxide.

Notice where the plants grow. They need protection and care to grow. You will not see many growing where people do a lot of playing and walking. Plants are a lot like people. They need water, food, energy, minerals, air (carbon dioxide), and tender loving care (TLC).

Plants are beautiful. Take a trip around your community to observe how people use plants to landscape their yards to make their homes more attractive. Look at the lovely flowers, trees, and shrubs. Imagine what homes would look like without grass, flowers, trees, and shrubbery.

Notice how animals depend on plants for survival. See birds building nests, squirrels gathering nuts, spiders spinning webs, rabbits nibbling on plants, grasshoppers hopping, and bees gathering nectar from flowers. Observe how people in your community use plants for food, homes, fences, shade, holidays, parks, forests, and wildlife.

TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

During a ten minute trip to the school site have students observe and record plants they saw.

Questions to guide observation and learning:

1. Where did you find plants growing?
2. Where do plants get their energy?
3. How do plants help people and animals?
4. What happens to some plants in the winter?

ACTIVITIES:

1. Use the five senses to investigate and experience plants;

Look - see where plants grow, their colors, how they help animals, dew drops on a leaf, leaves falling, their roots and shapes;

Feel - their smoothness, coolness, shapes, size, veins, petals, roots, and the soil around them;

Taste - berries, nuts, tomatoes, potatoes, popcorn, corn on cob, and beans (all these foods come from plants);

Smell - nuts, flowers, roots, berries, onions peeled, popcorn popping;

Listen -noises on or near plants or noises such as bees buzzing, birds chirping, and woodpeckers pecking.

2. Write descriptive words about their plant(s) and sketch or draw one of the plants.

3. Write a creative story about how it would feel to be a plant.

4. Research and report how plants are similar to and different from people.

   Find out:
   a. how they get their energy
   b. what happens to them during cold weather
   c. the resources they need to live
   d. how they help each other.

5. Experiment with plants to determine how they grow with/without water, sunlight, air, minerals, soil, certain temperatures, and fertilizers.

6. Role play plants receiving water, snow, sunlight, top soil, air, minerals, plant food, and fertilizers. Role play plants exposed to air and water pollution, wind storms, herbivores (plant eaters), careless people, and soil erosion.

7. Select poems and songs about plants and share them with the class.

8. Debate whether or not plants are as important as animals. Example: A Red Fox is more important than a Tulip Tree.

For activities 9-14, see Making Room for Science - resource section.

9. Construct a terrarium for the class.

10. Conduct experiments to determine effects moisture and fertilizers have on plants.

11. Observe the structures of roots, stems, flowers, and growth of a bulb plant.

12. Familiarize students with wildflowers on the school site and in the area.

13. Sketch a flower and write a poem describing its beauty. Study the parts of a flower and learn to identify them.

14. Demonstrate how new plants can grow from the parts of a plant (roots, leaves, and stems in water or soil).

15. Use the fifty trees of Indiana to identify trees (trees are out largest plants) on the school site and in the community. (Contact Indiana Department of Natural Resources [$1.00] - see resource section.)

EXTENSIONS:

1. Start a school garden. Assign each student a plot and provide seeds and bulbs. Maintain a garden journal.

2. Beautify the school site - plant flowers, trees, and grass. Plot their growth on a chart.

3. Conduct experiments growing plants in water. (See "Hydroponics", page 41, Make Room for Science.)

4. Conduct experiments with popcorn. (See "Popping Off," page 40, Make Room for Science.)

VOCABULARY

Photosynthesis	- the ability of plants to use sunlight to form chlorophyll.
Chlorophyll	- the energy the plant has made by collecting sunlight, water, minerals, and carbon dioxide.
Terrarium	- an enclosure for keeping, raising, and observing animals and plants.
Fossil Fuel	- energy formed from plants that lived millions of years ago (coal, natural gas, and oil).

ROCKS: EARTH'S FOUNDATION
K-6

OBJECTIVES:

1. Students will separate rocks into three main classifications.
2. Students will be able to identify regions of Indiana where igneous, sedimentary, and metamorphic rocks are found.
3. Students will identify at least two minerals found in rocks.
4. Students will explain how rocks are formed.
5. Students will explain where glaciers were found in Indiana and how they helped form the Indiana landscape.
6. Students will demonstrate how rocks are broken down to make soil.
7. Students will explain how rocks help people.

CURRICULAR AREAS:

Economics, Health, Language Arts, Science, and Social Studies.

TEACHER BACKGROUND:

Rocks form the hard solid crust of the earth. If they could talk, they would have many stories to tell for they have been in one spot many years. Geologists attempt to tell these stories as they trace the history of rock formations. Just as people have characteristics, so do rocks. They are divided into three main classifications: igneous, sedimentary, and metamorphic. Geologists use characteristics (physical properties) such as shape, hardness, color, luster, magnetism, and density to identify and classify rocks.

The rocks in Indiana and the Midwest are mostly sedimentary. They can range from pebbles to coarse boulders. Sand and gravel are forms of rocks. Indiana has many sand and gravel sites. For many years driveways and nearly all of the roads were constructed of gravel. The gravel and tiny pieces of rock in sand crumbled from larger rocks and were carried by water, wind, and glaciers. Sedimentary rock is made from parts of older rocks combined with organic materials from the remains of plants and animals who long ago lived in tropical seas that covered southern Indiana. The sedimentary rocks--limestone, sandstone,

shale, and dolomite rest on ancient igneous and metamorphic rocks. Each layer represents a different period of geologic time.

Igneous rocks were brought to Indiana by glaciers. Metamorphic rocks were changed through time and pressure to other rock forms. Slate and marble are good examples of this.

Rocks play a very important part in our lives. They are essential for survival. Because the chipping and crumbling processes change them into soil, we are able to grow fruits and vegetables. They are used to construct buildings, bridges, and homes. The early settlers often gathered the field stones to build sturdy fences, houses, and barns.

You can observe the layers of rocks in cuts for highways. Interesting rocks can be found near these highway cuts, mines, building excavations, cliffs, beaches, stone quarries, rivers, and creek banks.

Those who collect rocks are called "rock hounds." Collecting rocks is fun for children and adults. Many belong to rock and mineral clubs and trade rocks. Some people like small rocks and their collection can be displayed in a box. Medium sized rocks may need a shelf or table for display. Some people collect only large rocks and often display them in a nice arrangement in their yard or a rock garden. Maybe the class would like to make a collection in the room.

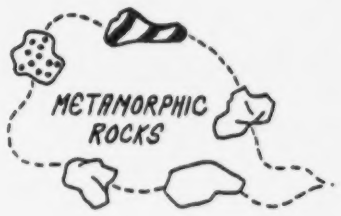
TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

1. Within a ten minute period, take a trip to the school site and have students observe rocks they found.

Questions to guide observation and learning:

1. Where did you find your rock(s)?
2. How do you think they got there?
3. What did you notice/observe about your rock(s)?
4. How do rocks help people and the environment?



ACTIVITIES:

1. Invite a rock collector or geologist to your class to discuss rocks and minerals. Help the students organize good questions to ask the speaker.

2. Take a trip to your outdoor classroom (school site) to search for rocks.

a. How did the rocks get here?
b. How were they formed?
c. How are they broken down to make soil? (weather, lichens, mosses, chemicals, etc.)

3. Take a field trip in your community to investigate how rocks benefit people.

4. Bring samples of various kinds of rocks to class.

5. Select a rock and research how it was formed, where it was found and how it got there. Have students demonstrate how rocks are formed.

6. Separate a collection of various kinds of rocks into major classifications.

7. Demonstrate the kinds of equipment used to collect rocks. Emphasize safety.

8. Discuss how fossils help make rocks. Bring fossil specimens to class or secure specimens from media center - have students identify similarities and differences between fossil specimens.

9. Take a field trip to a rock quarry or road cut to study how rock resources are formed and used. Have students collect their own samples. (Get permission to take samples)

10. Research various communities in Indiana that have been affected economically by rocks. (Bedford, Bloomington, etc.)

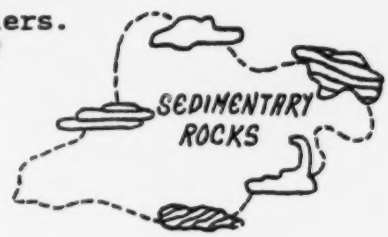
11. Discuss the importance of minerals in our economy.
    a. What would happen to us without iron?
    b. How important is copper in our lives?
    c. What are some other minerals we need for cars, homes, and bicycles?

12. Bring in samples of various kinds of minerals. Contact your media center or science department for specimens. Have students do research about minerals and give reports to class.

13. Construct a "ROCKS AND MINERALS" bulletin board or display.

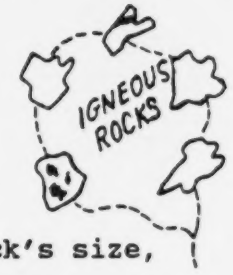
14. Use the "ROCK CYCLE" transparency to discuss how rocks were formed.

15. Research how Indiana was affected by glaciers.
    a. When was the last glacier in Indiana?



b. What kind of rocks did the glaciers bring to Indiana?
c. Have students draw or design a model of glaciers and share their designs and findings in class.

16. Demonstrate how glaciers formed the Great Lakes.



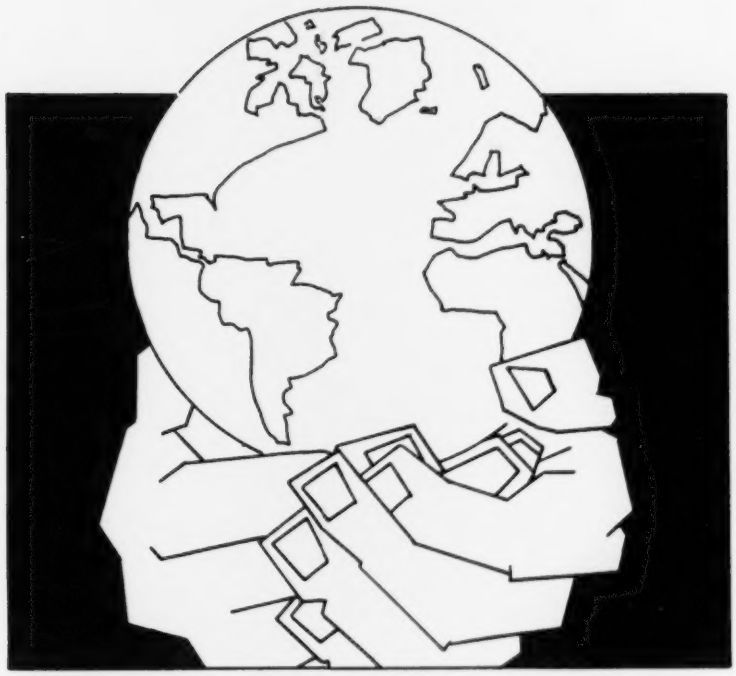
EXTENSIONS:

1. Have each student bring one rock to class and,
   a. Explain why they chose their rock.
   b. Draw a picture that closely matches the rock's size, color, shape and markings.
   c. Write a description of the rock. Have students place all rocks on a table and mix them. Then have each student pass the descriptions to another student to see if it can lead them to the rock described.
   d. Create a history of the rock. Use their imaginations to write or tell about where the rocks have been or what will happen to them in the future.
2. Write a creative story explaining how Rocks Make People Healthy.
3. Start a rock garden on the school site. (It can become a special place where students can go to observe, investigate, experiment, and classify.)
4. Use the senses to describe rocks. Write descriptions, sketch, and orally describe rocks.

VOCABULARY

Sedimentary Rock	- rocks formed from deposits of sediment (plants, animals, sand, silt).
Metamorphic Rock	- rock which changes from one form to another due to heat, pressure, and water.
Igneous Rock	- rocks formed by the hardening of molten magma.
Geologist	- a scientist who studies the history of the earth and its life as recorded in rocks.
Fossils	- remains of plants and animals of past geological age preserved in the earth's crust.

Glacier	- a large body of ice moving slowly over a land surface.
Limestone	- rock formed from the remains of life (shells and coral) that lived in oceans covering southern Indiana millions of years ago. Bedford, Indiana is famous for its limestone.
Sandstone	- a sedimentary rock consisting usually of quartz sand united by some cement (silica or calcium carbonate).
Granite	- a very hard igneous rock brought to Indiana by glaciers.



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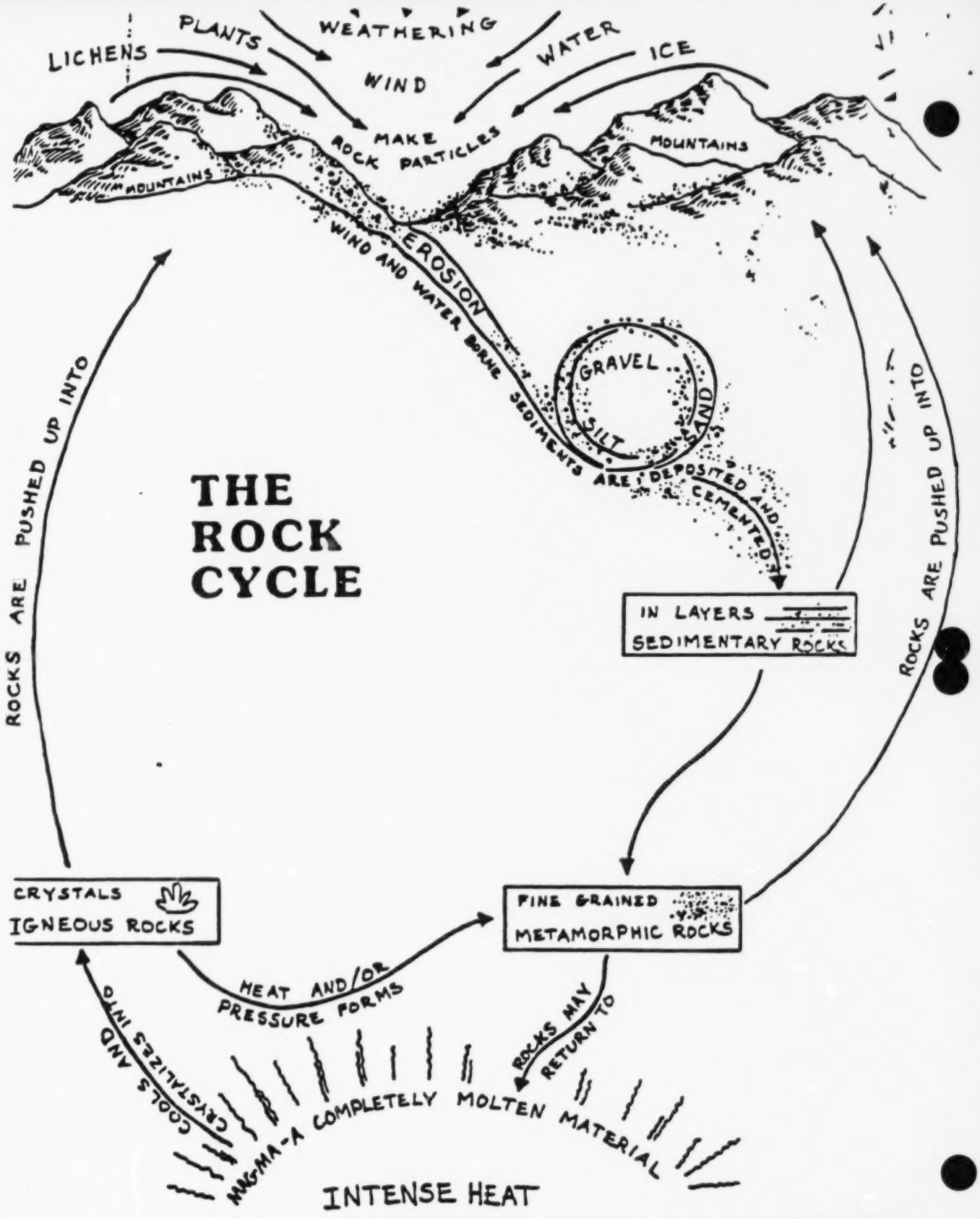
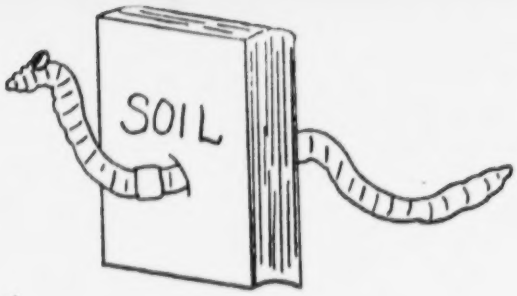


TPANSPARENCY

Adapted from: The Rock Cycle, Massachusetts Audubon Society



SOIL: LAND TREASURES

OBJECTIVES:

1. Students will explain the causes of soil erosion.
2. Students will describe the impact of soil erosion.
3. Students will plan and carry out erosion control practices.
4. Students will write a story describing the effects of soil erosion.
5. Students will trace five products in the home to soils.
6. Students will describe the major ingredients of soils.
7. Students will predict what will happen if Indiana farmland continues to be developed into shopping centers, homes, and highways.
8. Students will identify good and poor soil conservation practices.

CURRICULAR AREAS:

Arts, Health, Language Arts, Science, and Social Studies.

TEACHER BACKGROUND:

Soil is one of our most important resources. We need soil to grow food, trees, and important crops such as corn and soy beans. In addition, land and soil provide us shelter, protection, recreational pleasures, aesthetics, clothes, and medicines. People are linked to the land and soil. Unfortunately, we take the land and soil for granted. We contribute to soil erosion. It is estimated that 24 billion tons of precious topsoil are lost each year because people do not manage soil resources effectively. Research indicates that soil eroded from areas undergoing development can be as much as 500 times greater than in rural areas.

The consequences of soil erosion are many -- loss of productive agricultural land in rural areas and silt clogged streams and lakes. Soil is a land treasure we need to use wisely to survive. Good conservation practices will help insure a productive land for this and future generations.

Most of Indiana has fertile soil and a favorable climate which help produce a variety of crops and animals. About 75 percent of Indiana land is farmed. We must protect and manage this highly productive agricultural soil. We must prevent this precious treasure from being covered by concrete or used for housing or business developments.

All schools have soil resources. A trip to your school site will bring you in direct contact with soils. Take advantage of this resource by having your students observe, study, experiment, and help manage soils on your school property. Students can plant grass, trees, flowers, and shrubs to help prevent soil erosion. Students can also plant a variety of vegetables and watch them grow. They can even start an orchard or arboretum.

Your local soil and water conservation district (SWCD) staff can provide background materials, land use plans, conservation lessons, technical assistance, and local support for your program. Take time to visit this resource agency. You will meet a conservation friend who can bring excitement and adventure into your curriculum.

TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

1. Take a ten minute trip to the outdoor classroom and have students observe and list what they found in a special soil study area.

Questions to Guide Observation and Learning:

1. What did you find in your soil?
2. What do you think helps make soil?
3. How important is soil?
4. What can we do to help prevent soil erosion?

ACTIVITIES:

1. Discuss the components of topsoil:
   a. How is topsoil formed?
   b. Approximately how long does it take to form?
   c. How does topsoil benefit people and the environment?
   d. What factors contribute to the loss of topsoil?
   e. What can be done to manage topsoil more effectively?

2. Take a trip through the community and to the school grounds.
   a. Where is topsoil managed properly?

b. Where is topsoil not being managed properly?
c. What living things in the community depend on soil for survival?
d. Approximately what percent of the land in the community is covered by concrete? What effect does this have on soil, water, plants, animals, and people?
e. What happens to the water when it rains on a grassy lawn? What happens to rain when it hits concrete?
f. What impact will this runoff have on streams, rivers, and reservoirs?

3. Write a description of soil.

4. Write a short story describing "What Happened to the Land and Water" when soil erosion and water runoff got out of control.

5. Design experiments or plans for reducing soil erosion and water runoff.

6. Trace five products in the home or school to natural resources and soil.

7. Describe the major ingredients in topsoil.

8. Bring in various samples of soils. Analyze them to determine major physical differences.

9. Describe ways modern technology can alter the land in beneficial or detrimental ways (clear cutting, strip mining, reclamation, hazardous wastes, landfills, etc.).

10. Investigate and report on the effects of good farmland being used for shopping centers/housing projects:
    a. What caused farmers to sell to developers?
    b. How might we prevent this from happening?
    c. What is being done to prevent this from happening? (Ask your local soil and water conservation district (SWCD) for a copy of their land use plan or soil survey.)
    d. Write a story, "Can We Feed the World?" (if we continue to lose our farmlands).

11. Research the role of the local soil and water conservation district(SWCD) to determine:
    a. Their major programs
    b. How they help homeowners
    c. How can they help you determine where to build or not to build a home, school or business
    d. The information they provide about where to build septic tanks, homes, shopping centers, industry, etc.

e. What information they have about flood plains:

Have people actually built homes in flood plains?
Have developers built homes and businesses in flood plains?
What is the best use of flood plains?

12. Research the importance of waters to farmers:
    a. What effect do droughts have on Indiana crops?
    b. What can farmers do to help keep water on their land?
    c. What is a watershed?
    d. How will poor crops affect consumer prices?

13. Identify good and bad soil conservation practices.

14. Design experiments to determine relationships between soil compaction and it effects on soil aeration and water holding capacity.

15. Label parts of a root and describe its importance to the plant and soil.

EXTENSIONS:

1. Construct a soil profile area where students can observe and record important data and findings - temperatures, layers, textures, colors, etc.

2. Interview farmers, gardeners, landscape specialists, parents and grandparents to collect information and data about the importance of soil conservation.

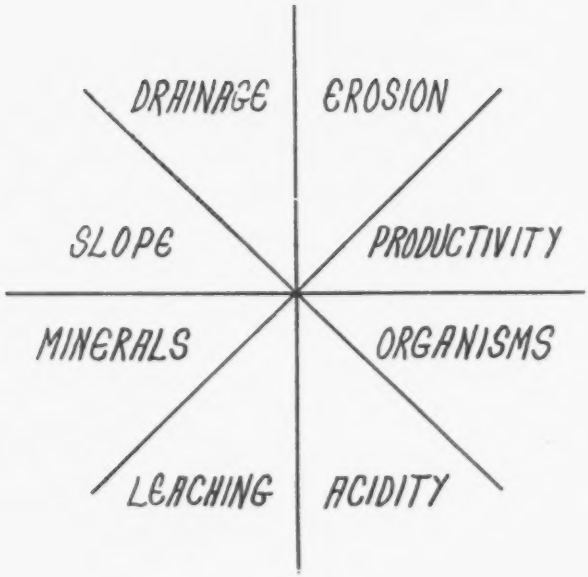
3. Plan an Agriculture Day for your class and school: Invite farmers, gardeners, senior citizens, soil specialists, and agricultural people to give demonstrations, conduct classes, and answer questions students have about soils, conservation and agriculture.

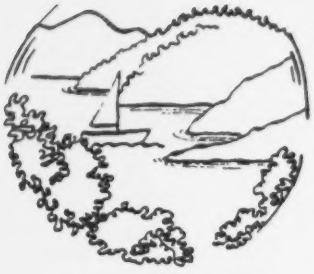
4. Make a display tracing food in the grocery store back to the soil (or clothes back to how they began).

VOCABULARY:

Soil - the upper layer of earth that may be dug or plowed and in which plants grow.

Erosion	- loss of top soil due to wind, water or ice.
Fertile	- capable of sustaining abundant plant growth.
Droughts	- prolonged periods of dryness.
Conservation	- wise and careful use of natural resources.
Flood Plains	- level land that may be covered by water.
Climate	- the average conditions of weather over a period of years





THE WATER COMMUNITY
K-6

OBJECTIVES:

1. Students will use the five senses to observe a pond or stream community.
2. Students will describe plants and animals by writing poems, songs and stories.
3. Students will select an animal and research its purpose in the pond or stream.
4. Students will construct a food chain.
5. Students will maintain a pond journal and make important recordings.
6. Students will sketch the pond or stream.
7. Students will observe microscopic life and describe what they saw.

CURRICULAR AREAS:

Art, Language Arts, Math, Music, and Science

TEACHER BACKGROUND:

Ponds and streams are homes for a variety of different animals. Frogs, tadpoles, minnows, water striders, turtles, water boatmen, dragonfly, mayfly, and caddis fly nymphs and water beetles live in a water community. They are adapted with special colors, legs, eyes, jaws, and senses to help them survive. Some animals eat other animals. They are called carnivores. Some animals eat only plants. They are called herbivores. An animal that eats both plants and animals is called an omnivore.

Food chains or pyramids are ways energy is transferred from plants to animals. For example, mayfly nymphs eat plants, which are eaten by fish, which are eaten by eagles. In a water community, animals prey on each other around the clock.

All living things need a place to live, a place to get food and water, and a place to raise young and hide from danger (shelter). This place is called a home or habitat.

Plants are very important in the water community. They provide water homes for animals and give off oxygen which animals breathe. More importantly, plants capture the sun's energy and store it through a process called photosynthesis. Plants are always the beginning of food chains. Without plants, life would not exist in the water community.

Plants and animals need each other. They are dependent on each other for survival. The study of their interdependence is called ECOLOGY.

Ponds and streams change over time. Seasonal changes effect pond life in many ways. In winter some animals survive by hibernating. Other animals such as the Dragonfly die as soon as they become adults, mate, and lay their eggs in a pond or stream. If possible have your students study a pond or stream throughout fall, winter, and spring. Some schools have constructed small ponds on their school site. This provides students with opportunities to study in detail plant and animal life throughout the school year.

Ponds are exciting places to visit. They are full of life, movement, change, colors, energy, and homes. Just by observing pond life, students can see, hear, smell, and feel animals, plants, rocks, water, wind, soil, decomposing life, and habitats. To build on these observations, have students use dip nets to collect animals and plants from the pond. Have them observe the colors, body parts, movements, and size of each animal. Do not worry about naming the animals. Assign that responsibility to the students. Ponds and streams are also exciting study areas to teach creativity. Have students write, sketch, imagine, role play, dance, and sing as they share feelings and concepts.

TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

1. Within a ten minute period, take a trip to the pond or stream and have students observe and record animals, plants, and natural resources.

Questions to Guide Observation and Learning:

1. What animals did you see?
2. Where did you see them?
3. What colors were they?
4. How do you think they live?
5. What plants did you see?
6. Where did you see them?
7. How do plants help animals?
8. What natural resource did you see?

ACTIVITIES :

1. Take a trip to a pond or stream to observe animals, plants and other resources.

2. Use the five senses to study and investigate a pond or stream.
   a. Feel - animals, water, plants, rocks, soil, and wind.
   b. Smell - plants, water, soil, and wind.
   c. Look - animals, plants, rocks, soil, habitats (homes) decomposing life, colors, ripples in water, and movement in water.
   d. Listen - animal sounds, water running, birds singing, rain falling on pond, night sounds (tape record), and fish jumping.

3. Write a description of the pond or stream.

4. Sketch the pond or stream.

5. Write a creative poem or story about the pond or stream.

6. Select an animal found in water and research what it eats, how long it lives, what eats it, and how it is adapted to live in water.

7. Use dip nets to collect life from the pond or stream. Place animals in a collecting pan to observe their movements, colors, body parts, and size.

8. Build a food chain from the plants and animals they collected.

9. Look for animal tracks near the pond. Have them list several animals that visit the pond or stream and explain why they do this.

10. Record temperature of the water and air. Discuss how this affects plants and animal growth.

11. Sit quietly by the pond or stream for ten minutes.
    a. Write creative stories or poems expressing their feelings.
    b. Share their stories and poems.

12. Select an area near the stream or pond and sketch a creative drawing of the water, sky, animals, and plants. Have them share art experiences. Use natural colors - grass, soil, berries, stain from nuts, etc.

13. Take samples of water back to the classroom and have students observe microscopic life.

14. Research what happens to animals during winter months.

15. Role play pond animals, plants, wind, water, and air. See if other students can guess what they are acting out - frog, snake, turtle, plants, etc.

16. Construct a bulletin board to show some of the animals and plants that live in the water.

17. Maintain a pond or stream journal which contains:
    a. animals they observed
    b. information about some of the animals
    c. plants
    d. temperatures
    e. poems/stories
    f. sketches
    g. food chains
    h. new words - food chains, habitats, adapt, herbivore, carnivore, etc.

18. Visit pond or stream several times each school year to make observations, take temperatures, and record new findings.

EXTENSIONS:

1. Construct an indoor pond in your classroom. An inexpensive children's swimming pool can make an excellent holding area for a pond. Try to find one made of polyethylene. A submersible filter will help keep the pond heated and clean. The following steps will help you design a quality life supporting indoor pond:

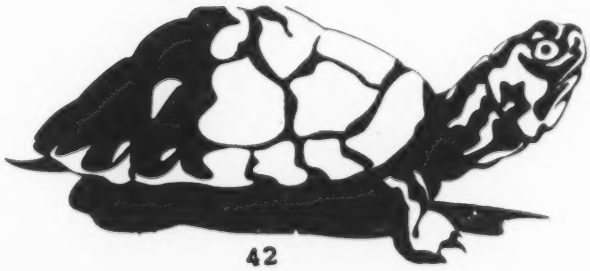
    a. Place a layer of washed stone or sand on the bottom.
    b. Pour water in and allow sand to settle before starting filter.
    c. Place large rocks around filter to form a habitat for pond animals.
    d. If you use tap water wait 24 hours before placing plants and animals in pond.
    e. Place duckweed, elodea, aquatic insects, waterflies, goldfish, guppies, salamanders, snails, and tadpoles in ponds.
    f. Provide habitats - rocks and clay pots make good homes.
    g. Other water animal brought in by children should be returned to their natural habitats after being observed. They will not survive in the new environment.

h. Clean the filter regularly.
i. Add water periodically to compensate for evaporation.
j. Empty the pool once or twice a year to remove algae growth.

2. Research (in the school library) frogs to find out:
   a. What they eat.
   b. How they live in the winter.
   c. How many eggs the females lay.
   d. Where they live.
   e. How far they can hop.
   f. What stories and poems have been written about frogs.
   g. Sounds frogs make and what the sounds mean. (See "Leaps in Learning" - Resource Section.)

VOCABULARY:

Habitat	- home for animals.
Carnivores	- meat eating animals.
Herbivores	- plant eating animals.
Omnivores	- eats both plants and animals.
Adapt	- how animals change to survive in an environment (colors, movements, body parts, etc.).
Food Chain	- an arrangement of animals in the pond or streams according to the order they will be eaten by other animals. Food chains should always begin with a plant. Example: Plant - tadpole - fish - snake.
Communities	- a group of animals living together in a natural environment.
Predator	- an animal that eats or devours other animals.
Prey	- an animal eaten by another animal.



TREE EXPERIENCES
K-6

OBJECTIVES:

1. Students will identify seasons by visible changes a tree undergoes.

2. Students will observe signs of environmental interaction such as the effects of weather.

3. Students will identify how changes in trees affect living and nonliving things.

4. Students will identify trees by their leaves.

5. Students will classify tree leaves according to shape, size and color.

6. Students will learn about plant processes and seasonal cycles.

CURRICULAR AREAS:

Arts, Health, Language Arts, Math, Science, and Social Studies.

TEACHER BACKGROUND:

Trees are a very important natural resource. Trees provide wood for furniture, homes, paper, pencils, chemicals, boats, bridges, and hundreds of other products. Trees provide employment for thousands of Americans. Carpenters, chemists, foresters, lumber jacks, naturalists, and boat builders are just a few of the many careers associated with the forestry industry.

Trees bring pleasure to people in many different ways. Most everyone has had a "special" shade tree in the yard or park that they could sit under to read, think, dream, or just keep cool on a hot summer day. Have you ever enjoyed watching a campfire in summer or enjoyed warmth from a fireplace in winter? Both are made possible because of logs cut from trees. Have you ever raked leaves into a pile in the fall and jumped or rolled in them? Have you noticed the delightful fragrance of the flowering trees in the spring? Have you sat on a favorite limb or in a treehouse looking down on "the world" or glided back and forth in a tree swing?

Trees play an important part in our world and nature. They provide oxygen for animals to breathe. Their roots help hold

and contain precious soil and water resources. Trees are solar (sun) collectors. They are able to collect the sun's energy (photosynthesis) to produce chlorophyll, an important source of energy. In addition, many trees bear fruit or nuts and are a valuable source of food for people and animals. Trees are also a renewable resource. This means we can harvest (cut) them, use them, and plant new ones to take their place. If we do this wisely and carefully (conservation), we will always have trees to provide homes, energy, and food for people and animals. Many nations have abused their forests. As a result their wildlife is disappearing, top soil has eroded, and water is scarce. In Africa, forests are becoming deserts because too many trees are cut for fire wood and animals browse on the few remaining ones.

Use the trees on or near your school site to teach students about their importance. Teach them to observe an adopted tree four to six times per year. Have them sketch, write about, read about, and research their tree. Have them keep scientific journals to record important information about their tree.

Start this exciting visit by looking around your school for likely candidates for your "adopt a tree" program. Trees that undergo obvious seasonal changes such as losing leaves, changing colors, or having blossoms will be the best.

TEN MINUTE OUTDOOR EXPERIENCE

Outdoor Activity:

1. Assign students a tree and have them go outside for ten minutes to observe and record data about their tree.

Questions to Guide Observation and Learning:

1. What did you learn about your tree?
2. How do you feel about the tree?
3. How is the tree able to live and grow?
4. What can you do to help it live and grow?

ACTIVITIES:

NOTE: The following activities may be used singularly or in combinations and may be an individual or group activity.

1. Plan for routine seasonal visits:
   - Late summer - meet our tree/trees orientation
   - Early fall - a trip at the time of color change
   - Late fall - a trip when the leaves begin to fall as the days grow shorter
   - Winter - a trip when the branches are bare

Early spring - a trip when the buds are visible on the limbs
Late spring - a trip when leaf buds are opening

After each seasonal visit, have the students draw the tree as they saw it. Have them write a paragraph description of the tree after each visit.

Then, after seeing the tree in four seasons, they can have a pictorial history of their tree. A "class tree" or a four seasons mural could be a continuing project.

2. Make in-between trips when the children may engage in more detailed investigations to:
    a. Note the size and shape of the tree and its leaves
    b. Inspect the bark
    c. Notice the branching patterns
    d. Look for signs of environmental interaction, such as the visits of living creatures and the effects of weather.

3. Discuss the class findings on the various trips and encourage follow-up research based on questions such as:
    a. What are the visible changes in the tree with the change of season?
    b. What causes these changes?
    c. What changes in the tree are caused by living things including humans?
    d. How do changes in the tree affect living and non living things?
    e. What animals live on/in the tree or visit the tree?

4. Keep a record book and illustrate it with photos and art work.

5. Keep an imaginative diary from the tree's point of view.

6. Research the tree's family and related species and its economic and ecological value.

7. Research what the tree needs to grow. Example: water, minerals, sunlight, and carbon dioxide.

8. Measure the tree's circumference and calculate its height.

9. Write poems describing observations and expressing feelings about the tree.

10. Write stories in which the tree has a starring role.

11. Study the production of maple syrup. Draw maple sap from a maple tree to make maple syrup.

12. Take a field trip to a lumber yard.

13. Collect different woods such as walnut, maple, oak, cherry, cedar, etc. The woods could be natural or finished. Compare the different woods for color, such as: the walnut would be dark brown, the oak would be light and the cherry would have a reddish tone.

14. Conduct a survey of furniture at home to see what woods have been used. Make lists of things at home that are made from wood.

15. Take a walking field trip so that students might learn to identify trees according to their leaves, shapes or barks.

16. Make a study of trees and their leaves. Compare the leaves of different trees for size, shape, and color. List the different ways to group them.

17. Complete the "Tree Leaves" ditto. Make a collection of tree leaves.

18. Measure the length of the classroom using different tree leaves as the unit of measure.

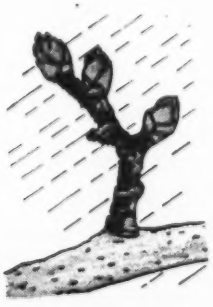
19. Make a collection of winter twigs of trees and shrubs. This collection could be combined with the leaf collection. Note whether they are from trees or shrubs. These might be collected when leaves are present for identification purposes.

20. Make leaf people.

    Materials: Leaves from a variety of trees
    Construction paper - 12 x 18
    White Glue
    Crayons

    Procedure: Dry and press leaves
    Glue leaves on paper for body, head, arms, and legs
    Use smaller leaves for hats, shoes, etc.

21. Research how a tree is similar to a person. Example: trunk, limbs, tall, short, different colors, skin-bark, crown-head, blood-sap.



EXTENSIONS:

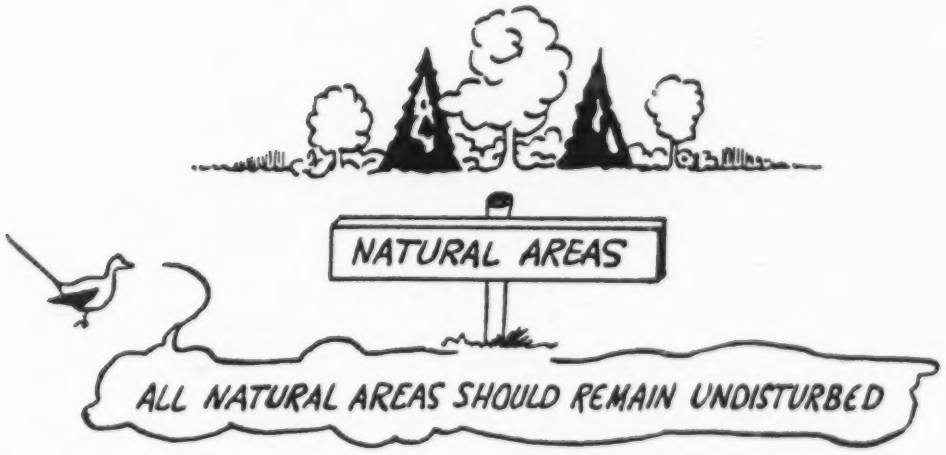
1. Design creative bumper stickers and display them. (Example: **TREES ARE TREERIFIC.**)

2. Plant a wind break on school site.

3. Start a school orchard.

VOCABULARY

Tree	- a woody plant having a single main stem with few branches in its lower part.
Perennial	- present during all seasons of the year.
Natural Resource	- resources supplied by nature (air, soil, rocks, trees, wildlife, energy).
Circumference	- the perimeter (distance around) of a circle or object.
Lumber	- timber or logs dressed for using to construct homes, bridges, fences.
Wind Break	- a growth of trees serving to break the force of wind.
Leaf	- outgrowth from stem and functions to make food through photosynthesis.
Photosynthesis	- the ability of plants to use sunlight to form chlorophyll.



TREE LEAVES

BEECH ELM RED OAK BLACK GUM HICKORY

SYCAMORE WHITE ASH REDWOOD REDBUD SUGAR MAPLE

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

NAME _____

WATER: A PRECIOUS RESOURCE
K-6

OBJECTIVES:

1. Students will explain the source(s) of water used to supply their school and community.

2. Students will explain how the treated water supply affects the health and economics of the local community.

3. Students will construct a series of food chains within the local watershed.

4. Students will compare and record plant and animal life in the watershed through various seasons.

5. Students will describe how plants benefit animals living in the watershed.

6. Students will construct a map tracing school water to its source in the watershed.

7. Students will describe how plants benefit animals in the watershed.

CURRICULAR AREAS:

Arts, Health, Language Arts, Math, Music, Science and Social Studies.

TEACHER BACKGROUND:

Water is a basic ingredient for our bodies. We need it to survive. People can live longer without food than water. This is because water regulates the temperature of the body; carries important nutrients to organs, cells, and tissues; and removes wastes from the body. Over 70 percent of our body weight is water. This is why it is important to eat and drink foods that contain water. Water also makes up over 80 percent of our blood and lubricates body joints. Each day humans must replace two quarts of water to maintain their health. Before most people use water in their homes, it is specially treated (purified) by local water companies. Indiana is fortunate. It has an outstanding supply of fresh water resources. We need to learn to appreciate water and use it wisely (conservation) so that people, animals, and plants living now and in the future will always have a safe and abundant supply.

Each community in Indiana has a watershed. A watershed is a water storage area. It includes streams, ponds, forests, yards, parks, school playgrounds, and streets. We need to manage (take care of) watersheds to make certain we will continue to have an adequate supply of safe and usable water for people, plants, and animals.

Over 70 percent of the earth's surface is covered with water. The total amount of water on the earth remains essentially constant. Water changes form, but does not disappear. The water cycle has no starting or ending point. Water molecules you drink today may have been in the water consumed by a dinosaur that lived millions of years ago.

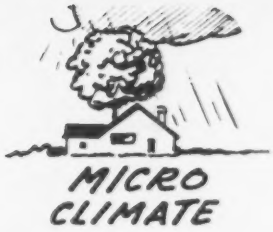
The majority of people living in Indiana are served by public water supply systems. Cities obtain water from either streams, rivers, lakes, or ground water. The amount of water in a stream or river may be too small to supply demands during high use or low flow periods. Cities build reservoirs to store water to assure an adequate supply.

Nearly all water used by cities receive some form of treatment before use. A water treatment plant may put water through a number of purification processes such as coagulation, settling, filtration, and disinfection.

Industry uses large amounts of water to produce consumer goods. It takes 10 gallons of water to produce one gallon of gasoline, 65,000 gallons to produce a ton of steel, 100,000 gallons to make an automobile, and 136 gallons to make one loaf of bread. Food processing also uses large amounts of water. Fruits and vegetables must be washed before they are canned or frozen. Water is also used in the production of soft drinks and other beverages.

Only about two percent of the water used by industry is consumed. The remainder is returned largely to streams and lakes. These activities produce a variety of pollutants. Water that has a pH of less than seven is easily polluted with metals. Lead and arsenic are common industrial pollutants. These pollutants are cumulative in their effect on organisms, so even though they may be present in small amounts, they may, over time, lead to serious health problems.

Action must begin immediately to protect and manage Indiana's precious water supplies. We are fortunate to live in a state which contains a high volume of water resources. Some other states are not as fortunate. Arizona and California water supplies are disappearing rapidly. Water in these states is expensive and must be used carefully to prevent shortages.



TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

1. Within a ten minute interval, find and record the animals and plants that depend on water for survival.
2. After a gentle rain, have students observe and record evidence that the rain water stayed on the school site (rain drops, moisture in ground, puddles, wet grass).

Questions to Guide Observation and Learning:

1. What organisms have you found that depend on water? How do you know this?
2. What would happen to these organisms without water?
3. What happened to the rain after it fell on the school grounds? How do you know (watershed)?
4. What would happen if we covered the school ground with concrete? How would this affect the plants and animals living here?

ACTIVITIES:

1. Have students list reasons why water is important to their health (write ideas on board or tape record them).

2. Draw pictures showing how they use water.

3. Take a trip to the local water treatment plant to observe and investigate how water is purified and treated.

4. Define the term "watershed." Discuss drainage patterns noted during rain. List the various kinds of precipitation which supply water to the shed, (i.e., rain, snow, sleet).

5. Locate on a map the sources of water for their community. Explain in a class play how the water cycle benefits the watershed.

6. Explain how people manipulating the environment have affected the source and quality of water supply for the watershed, i.e., compare the runoff from paved area or large building to a grassy or natural area of the same size.

7. Construct a series of food chains found in the watershed. Example: Plant--tadpole--snake--bird.

8. Write a short story depicting life in the year 2000 after man has destroyed all food chains within the local watershed. (Example: all plants die.)

9. Compile a list of questions and concerns which students and citizens have about their watershed. Tape record interviews with local authorities and citizens regarding their concerns about local water supplies.

10. List forms of life found in warm seasons as compared to forms observable in winter. Have students make inferences about what happens to different life forms during the winter. Have them research to answer:
    a. Where have the birds gone?
    b. What happens to frogs during the winter?
    c. If we take a chunk of ice back to the classroom and melt it, do you think we may see different kinds of life?
    d. If animals are living in water during the winter, how do they survive?

11. Ask the county surveyor or city engineer for a drainage map. Locate the school on the map. Draw a map tracing water supplies from the school to its source. Draw a map which shows how water reaches the school. On the map, indicate where runoff water and sewage go after it leaves the school. Have students follow their map to the point where the runoff water and sewage is discharged. Have them list the advantages and disadvantages of the present system.

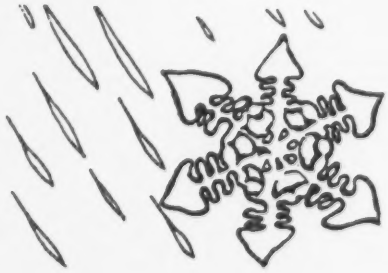
12. Explain how the local water supply is treated and how this treatment affects the health, economics and recreation potential of the community.

    Interview the county sanitarian about the local water supply to determine:
    a. What are the problems?
    b. What are projected needs?
    c. Is the water treatment expensive?

    Photograph or collect pictures which demonstrate how water is used in the community.
    a. In what ways is water being misused?
    b. Make suggestions for reducing consumption of water ?

    Survey the school and community to determine how wisely water is being used.
    a. Develop a water use plan for the school.
    b. Develop a water use plan for each home.

13. Write a creative story, poem, or play which explains the value of food chains to an adequate water supply. Suggested activities:



Assign to each student one animal or plant in the watershed and have him prepare a report which explains its importance.

a. What is its function in or near the water?
b. What would happen to the water without this plant or animal?
c. How does it help people?

Predict the consequences of a factory or housing project constructed near the water supply.

a. In what ways will this affect the water?
b. What are the environmental decisions which must be made to prevent destruction of the ecosystem?

14. Develop a plan for improving the watershed. Discuss possibilities of what has been learned into a workable plan of action such as:

a. Banks to hinder erosion
b. Letters to government, industry, etc.
c. A plan of action for the school to implement.

EXTENSIONS:

1. Listen to a book being read about a sea or water adventure, such as Paddle to the Sea; then have the students either dictate or write a short water adventure story, water fantasy tale, or poem about the water, sea, ocean, or rainfall. Display these stories on a bulletin board. The students could draw a picture to go with the stories.

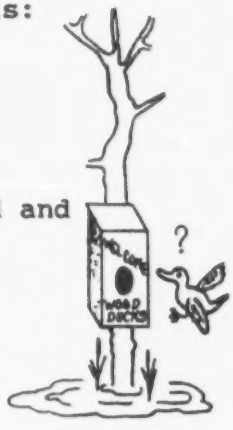
2. Interview each other on a tape recorder about ways to conserve water.

3. Dramatize or act out their favorite water activity and students can try to guess the activity, such as water skiing. The teacher can select the activities and write them on a slip of paper and place them in a container. Each student can select an activity slip and act it out.

4. Write a short story about a selected animal or plant and tell how it uses water. Suggested plants and animals:

a. Polar Bear
b. Cactus
c. Camel
d. Otter
e. Water Lily

5. Select magazine pictures that show how water is used and write a report or tell the class about them.



6. See films on water and discuss how humans, plants, and animals are affected by water resources.

7. List all the songs that have water as their subject. The class can then learn some of the songs and sing them together. (Row, Row, Row Your Boat, Red River Valley, Raindrops Keep Falling On My Head, etc.).

8. Identify several sources of water (river, lakes, rain, springs, etc.).

9. Interview people from another country to find out how they use water.
   - Where does it come from (streams, lakes, dams, springs, etc.)?
   - How is it made safe to drink?

10. Make class collages of the ways people use water, such as:
    a. For recreation
    b. For health
    c. For business
    d. Around the house.

    This can be done over a period of time. When the collages are finished they can be displayed on the classroom walls.

11. Keep a record of the amount of rainfall over a specific period of time.

12. Keep a personal record of each time during a week they use water and why it was used. Their personal records can be shared with the class and then displayed.

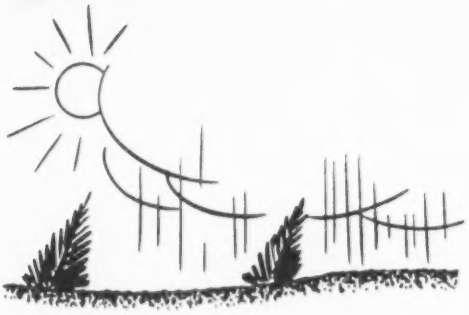
13. The teacher can bring in different samples of water, such as water from the city, from a well, from a water conditioned fountain, etc. The students can taste the different samples and discover that all water does not taste the same. The class can then brainstorm and discuss why water tastes different. (Concepts like minerals in water and purification methods, can be covered.)

VOCABULARY

Watershed - a water storage area draining into another body of water.

Conservation - Wise and careful use of natural resources.

Water	- a liquid falling from clouds. A major component of all living matter. Orderless, tasteless. H2O.
Molecules	- the smallest particle of a substance composed of one or more atoms.
Water cycle	- the continuous renewal of water through the processes of evaporation, condensation, and precipitation.
Precipitation	- rain, snow, sleet, ice, fog.
Evaporation	- reducing amounts of water vapor through invisible particles rising.
Condensation	- water vapor rises and collects with other vapor to form clouds.



WEATHER WATCHERS
K-6

OBJECTIVES:

1. Students will use their observation skills to experience and predict weather. They will heighten their skills through measuring rainfall, air temperature, and relative humidity.

2. Students will become skillful in using weather instruments and reports to help predict weather. They will determine wind direction and barometric pressure.

3. Students will be able to make predictions about moods as relate to weather conditions.

4. Students will collect pictures, create poems, stories, art sketches, and songs about weather.

5. Students will maintain weather journals, charts, and records.

CURRICULAR AREAS:

Art, Health, Language Arts, Mathematics, Music, Science and Social Studies.

TEACHER BACKGROUND:

Weather is an exciting topic for students to investigate and experience. By using the skills of observing, predicting, measuring, researching, and recording, students can determine daily weather conditions and predict monthly and seasonal weather.

Start a weather unit by having students use their five senses to observe wind, rain, snow, sleet, clouds, temperatures, and the sun. They can see, feel, smell, hear, and taste clouds, wind, rain, snow, ice, thunder, and lightning. They can also use their senses to predict weather conditions daily, monthly, and seasonally.

Creativity should become an important part of the weather module. Students should be encouraged to create poems, stories, and songs about rain, wind, snow, thunder, and lightning. They should be introduced to new and exciting words and concepts such as velocity, pressure, atmosphere, humidity, gusts, moisture meteorology, climates, water cycle, and barometric pressure. Students should be encouraged to read books about weather and act out a story or event about a storm.

A culminating experience for a weather unit would be to construct or purchase a weather station. Weather stations can be built on the school site and can contain a barometer, sling psychrometer, rain gauge, thermometer(s) (wet bulb and dry bulb), wind vane, anemometer, compass, weather study chart, and yard or meterstick.

Students should utilize the weather stations by taking daily readings. Student can be trained to read the weather instruments and charts. These "weather birds" will become experts as they gain skills, experience, and confidence. By collecting weather data and making predictions based on their observations and instrument and chart readings, they will learn to become more accurate.

Weather conditions play a vital role in determining what kinds of corn, soybean, and wheat harvests we have in Indiana. A dry season can cause farmers to lose their crops. These shortages drastically affect the economy. When this happens, we pay more for agriculture products. What happens to the price of oranges in Indiana when Florida is hit by a severe winter storm which destroys most of the oranges? What happens to the price of meat at your local market when Indiana cattlemen do not raise enough cattle due to lack of rain and feed? Weather conditions play a very important part determining the supply, demand, and price for products. The greater the supply of cattle and oranges, the cheaper they will be at the market. If the supply of cattle and oranges are reduced their prices are increased at the market. This economic concept also applies to corn, soybeans, popcorn, pork, apples, tomatoes, berries, wheat and turkeys.

Weather conditions can also affect our health. For example people with sinus, arthritis, heart, and respiratory problems are affected by heat, moisture, and cold air. People with severe respiratory and heart diseases sometimes leave cold and humid climates and move to warmer and dryer climates such as Arizona, Texas, Nevada, and California.

In Indiana, severe storms can destroy homes, animals and lives. Hoosiers must keep a watchful eye out for tornadoes. These deadly "spinners" can destroy crops, cattle, homes, pets, businesses, and lives. Hoosiers must also watch out for severe winter storms. Blizzards can create tremendous health problems. People can freeze to death when stranded in their automobiles and homes without heat.

Weather can also affect how we feel. Rain can make us sleepy. Cloudy days can make us feel depressed. Sunny days make us feel bright and cheerful. Snow adds a special touch to the spirit of the winter holidays. Hot and humid summer weather often makes many people tired and grouchy. Find out how weather affects

your students' moods. Find out how they feel on sunny, hot, rainy, snowy ,and cloudy days.

Indiana has an excellent climate for agriculture. It has good soil, an excellent fresh water supply, and weather conditions ideal for growing crops. Corn, soybean, wheat, popcorn, tomatoes, green beans, and apples are among Indiana's agriculture products.

Teach your students to observe, predict, record, and chart weather. Teach them to keep accurate records and reports. Through a study of weather, you can teach all the subject areas. You can also provide students opportunities to experience weather instruments and conditions. Most importantly, you can help make learning fun and relevant.

TEN MINUTE OUTDOOR EXPERIENCES

Outdoor Activity:

1. Take a ten minute trip to the outdoor classroom and have students observe and record weather information.

Questions to guide observation and learning:

1. What did you see which tells you something important about the weather?
2. What did you feel which might help you predict weather?
3. What did you hear which might help you determine the weather?
4. How important is it to observe and study weather?

ACTIVITIES:

1. Take a trip to the outdoor classroom to investigate and experience weather. Use the five senses, make observations and record sensory descriptions about weather. You may want to go several times to allow the children to make comparisons. Depending upon the weather conditions encourage them to:
   a. Feel the wind, moisture, heat, coolness, snow, and rain
   b. Look at the clouds, snow flakes, raindrops, and storm fronts.
   c. Smell the air before and after a summer rain, snow storm, and wind storm.
   d. Taste clean rain, snow flakes and icicles.
   e. Listen to wind, lightning, thunder, rain and sleet.
2. Write descriptive words and statements about these observations. Sketch/draw clouds, snow, rain, fog, lightning, wind blowing,

and sunshine. Present sensory descriptions, poems, songs, stories, and songs about clouds, rain, snow, thunder, lightning and storms.

3. Maintain a weather journal to record daily readings, rainfall, snowfall, predictions, vocabulary, poems, songs, stories, charts, etc.

4. Watch or listen to a television or radio weather report. Report new words, temperatures, barometric pressure, predictions. Report this information to class.

5. Interview a weather expert. Prepare interview questions. Examples:
   a. What data, equipment and observations do you use to make your weather predictions?
   b. What education and training is required to become a meteorologist?

6. Photograph, sketch, or collect pictures showing how weather effects people, animals, and plants. Share these with the class or create a "weather" bulletin board.

7. Write a creative story which tells about a happy weather experience, such as a beautiful snowfall, a lovely summer rain, or a majestic sunset.

8. Interview each other on a tape recorder about a weather experience which they will never forget.

9. Dramatize or act out a weather event such as snow, rain, fog, wind, tornadoes, clouds, sunshine, blizzard, etc.

10. Make a class collage about the way weather affects people, animals and plants.

11. Construct a weather station in an area where equipment and charts will be protected from vandalism. Teach students to read weather tools.
    a. Barometer - teach students how to predict weather by using barometer readings and observation skills.
    b. Thermometer - have them make daily indoor and outdoor temperature readings and record this data.
    c. Anemometer - have them take and record daily readings.
    d. Rain Guage - record and chart rainfall information and use this information to study weather patterns.
    e. Wind Vane - record wind data in journals and use in daily predictions.

12. Prepare a group of students to be "Weather Birds." Provide them the knowledge and skills to be accurate in predicting weather. Have them give weather reports and predictions to class and school each day. "Weather Birds" could change each week or month. Provide each student an opportunity to become a member. Prepare special "Weather Birds" cards, certificates, and tee-shirts for qualified members.

13. Have "Weather Birds" prepare other students in class to become proficient in using weather instruments and charts.

14. Read books about weather. Share their favorite part of the books. List new words and their meanings.

EXTENSIONS:

1. Maintain a large weather chart in class where all students and parents can see daily, monthly, and yearly data, observations and predictions.

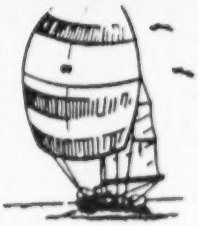
2. Report "Weather Birds" data, observations, and predictions to local radio stations and U.S. Weather Bureau offices.

3. Make a large calendar for your classroom. Each day have a student draw a picture to represent the weather for the day. At the end of the month, cut calendar into individual days. Place the days that show the same or similar weather in rows or columns to design a bar graph. Ask students to observe the bar graph and draw conclusions.

    a. How many sunny, rainy, snowy, windy and cloudy days did we have?
    b. Which kind of weather did we have most often?
    c. Which weather conditions made you feel best?
    d. What do you think caused you to feel this way?

4. Make an experience chart for each season by drawing and describing one experience they enjoyed during each season. (Fishing, camping, hiking, biking, etc.)

5. Tape record sounds associated with weather and seasons and share them with the class. Canadian geese honking, rain falling, nuts and apples falling, christmas music, wind blowing, thunder, sleet falling, birds chirping, ice skaters, etc. Try to record a sound which no one else will record.

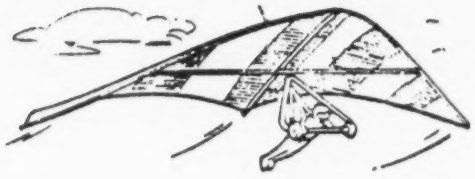


VOCABULARY:

Anemometer	- an instrument for measuring and indicating the force or speed of the wind.
Barometer	- an instrument for determining the pressure of the atmosphere. Readings can assist in predicting probable weather changes.
Thermometer	- an instrument for determining temperature. It consists of a glass bulb attached to a fine tube of glass with a numbered seal and containing a liquid (mercury or colored alcohol) that is sealed in and rises and falls with changes of temperature.
Rain guage	- an instrument for measuring the quantity of precipitation.
Wind Vane	- a movable device attached to an elevated object for showing direction of wind.
Barometric Pressure	- the pressure of the atmosphere usually expressed in terms of the height of a column of mercury.
Relative Humidity	- the ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature.
Precipitation	- a deposit on the earth of hail, mist, rain, sleet or snow. A quantity of water deposited.
Psychrometer	- consists of two similar thermometers with the bulb of one being kept wet so that the cooling results from evaporation makes it register a lower temperature than the dry one.

MAKING WEATHER INSTRUMENTS:

Write for a copy of Make Room For Science. See resource section.



RESOURCE SECTION - OUTDOOR EDUCATION

CURRICULUM AND PROGRAM RESOURCES

Many schools, publishing companies, resource agencies, and environmental groups provide curriculum materials, environmental resources, and services to schools. The list is endless. Rather than listing each one, a selected list is provided to supplement the lessons in this guide and to provide additional program assistance.

A. Local and State Programs and Assistance

1. Local Soil and Water Conservation District (SWCD)
   Ask for the following information and assistance:
   a. Outdoor classrooms
   b. Wildlife food plots
   c. Trees and plants to attract birds
   d. Soil and water educational resources
   e. Technical assistance to help design outdoor classrooms
   f. Water monitoring holes
   g. Soil profiles
   h. Flood plains
   i. Maps of your school and community
   j. Erosion control assistance
   k. Teaching soil and water conservation
   l. Conservation and the water cycle poster
   m. Soil profile and soil ecosystem overhead transparencies

   Contact:

   USDA Soil Conservation Service
   6013 Lakeside Boulevard
   ATTN: Public Affairs Specialists
   Indianapolis, IN 46278
   (317) 290-3222

2. Indiana Department of Natural Resources
   Ask for information about Indiana:
   a. Wildlife
   b. Nature Preserves
   c. State Parks
   d. Reservoirs
   e. Topographical maps
   f. Fish and wildlife areas
   g. Trail systems
   h. Canoe routes
   i. OUTDOOR INDIANA magazine
   j. Natural resource films
   k. State Forests

l. Publications
m. Recreation areas
n. Take Pride in America

Write to:

Public Information
Indiana Department of Natural Resources
Room 612, State Office Building
Indianapolis, IN 46204

3. Project Learning Tree (PLT)
This K-12 interdisciplinary natural resources education curriculum supplement is available at no charge to all classroom teachers who attend a PLT workshop.

For more information contact:

Shelley Mitchell
State PLT Coordinator
6013 Lakeside Boulevard
Indianapolis, IN 46278
(317) 290-3223

4. Project WILD
This K-12 interdisciplinary wildlife education curriculum supplement is available at no charge to classroom teachers who attend a Project WILD workshop.

For more information contact:

Warren Gartner
State WILD Coordinator
6013 Lakeside Boulevard
Indianapolis, IN 46278
(317) 290-3223

5. Indiana Department of Education
The Office of School Assistance can provide information and assistance about:
a. Take Pride in America
b. Model outdoor education programs
c. Summer environmental studies programs
d. Indiana Curriculum Proficiency Guide
e. State and national resources

For specific information about the above programs, contact:

Joe Wright
Environmental Science Consultant
Office of School Assistance
Indiana Department of Education
Room 229, State House
Indianapolis, IN 46204-2798
(317) 232-9141

6. Allen County Public Library
Resources available:
   a. Johnny Appleseed, Orchardist - a booklet prepared by the staff of the Allen County Public Library.
   b. The Arts Salute Johnny Appleseed - a collection of eighteen poems about Johnny Appleseed.
   c. Johnny Appleseed - an original one-act play by Richard Starr (1929).
   d. Johnny Appleseed - A Ballad by John Roe.
   e. Johnny Appleseed - Our American History Dramalogue by William A. Duff (1929).

Allen County Public Library
900 Webster Street
Fort Wayne, IN 46802
(219) 424-7241

7. Indiana Department of Commerce

Division of Energy Policy
1 North Capitol Avenue
Suite 700
Indianapolis, IN 46204-2288
(317) 232-8986

Ask for information and programs about:
   a. Energy education materials (K-12)
   b. Solar
   c. Coal
   d. Nuclear
   e. Gas
   f. Oil
   g. Wood
   h. Methane
   i. Wind
   j. Project NEED
   k. Energy Conservation
   l. Recycling

8. County Cooperative Extension Service
Ask for information and programs about:
   a. Wildlife
   b. Weather
   c. Water
   d. Plants
   e. Conservation
   f. Rocks
   g. Insects

Contact your local cooperative extension service office (in the yellow pages).

9. William E. Wilson Education Center
630 Meigs Avenue
Jeffersonville, IN 47130

Ask for:
Make Room For Science
This Title II Program, funded by the Indiana Department of Education, contains 218 K-6 science activities written by elementary teachers.

10. Indiana Farm Bureau
301 East Washington Street
Indianapolis, IN 46204

Ask for:
a. School-farm programs
b. K-6 Agriculture Education Programs
c. Nutrition Programs
d. Fourth Grade Agricultural Activity Guide

11. Division of Health Education
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46202

Ask for information and resources about:
a. Water pollution
b. Air pollution
c. Sewage treatment
d. Water treatment
e. Recycling
f. Landfills
g. Hazardous waste dump sites
h. Environmental films

B. National Programs and Resources

1. National Wildlife Federation
1412 Sixteenth Street North West
Washington, D.C. 20036-2266

Ask for:
a. Backyard Wildlife Habitat
b. Ranger Rick magazine
c. Nature Scope (K-7)
d. Class Project (7-9)
e. Wildlife Week

2. Soaring Hawks
Defenders of Wildlife, Inc.
1244 Nineteenth Street North West
Washington, D.C. 20036

Also ask for information about: Eagles, Owls, and endangered species.

3. National Audubon Society
Ask for speakers and materials.

National Audubon Society (or local Audubon Club)
950 3rd Avenue
New York, NY 10022
(212) 546-9126

4. Thinking Globally and Acting Locally: Environmental Education Teaching Activities
Endangered Species, Grades 4-9, write to:

ERIC
The Ohio State University
College of Education and of Natural Resources
1200 Chambers Road, Third Floor
Columbus, OH 43212

5. Stuart Smith
National Water Well Association
500 West Wilson Bridge Road
Worthington, OH 43085

Ask for:
Water Resources Kit

6. THE STORY OF DRINKING WATER This exciting interdisciplinary K-6 teachers guide is available by contacting your local water company or:

American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

7. Patricia A. Bonner
P.O. Box 32869
Detroit, MI 48232
(313) 226-2170

Ask for:
a. Great Lakes Notebook - Fourth Coast Facts and Sheets

b. Fact Sheet on Acid Rain
c. Great Lakes America (EPA)
d. Fact Sheet - The International Joint Commission

8. Collecting Rocks
Branch of Distribution
U.S. Geological Survey
1200 South Eads Street
Arlington, VA 22202

9. Landforms of the United States
Eastern Distribution Branch
U.S. Geological Survey
604 South Pickett Street
Arlington, VA 22202

10. The Growing Classroom: Becoming A Farmer (Book 1), Science Book 2), and Nutrition (Book 3)
Friends of the Harvest Life Lab
966 Bostwick Lane
Santa Cruz, CA 95062

11. The World Around You: Recycling the Organic Way; How to Grow a Garden

The Garden Club of America
598 Madison Avenue
New York, NY 10022

12. The Youth Gardening Book ($6.95)
Gardens for All

The National Association for Gardening
180 Flyan Avenue
Burlington, VT 05401

Builds basic skills: Word Games, charting growth, keeping a journal.
Learn about Animals: raise worms, build birdhouses, make insect nests.

13. Chevron Chemical Company
Educational Materials
Public Affairs Department
575 Market Street
San Francisco, CA 94119

Ask for:
A is for Apple
Celebration of Life and Trees

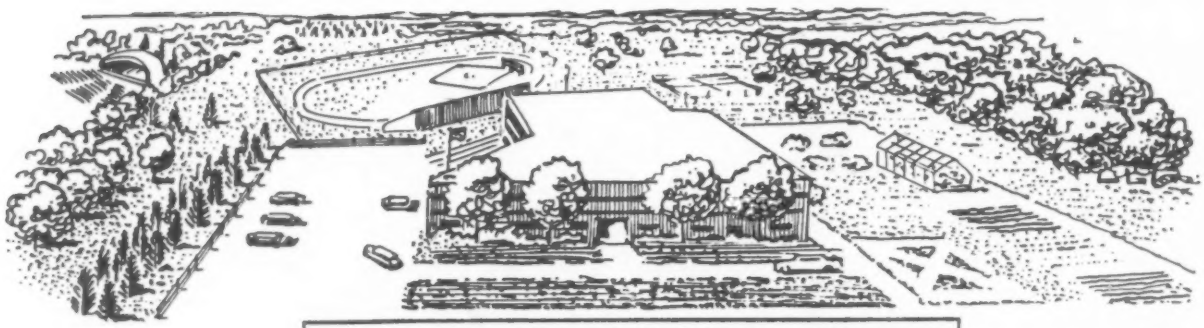
14. Wayne-Hoosier National Forest
811 Constitution Avenue
Bedford, IN 47421
(812) 275-5987

Ask for information about:
a. Timber Stand Improvement (TSI)
b. Wilderness areas
c. National forests
d. Hiking trails
e. Wildlife
f. Camping areas
g. Forest fires
h. Careers
i. Trees
j. Smokey Bear
k. Woodsey Owl
l. Smoke Jumping

15. Learning Magazine
P.O. Box 51593
Boulder, CO 80321-1593

"Leaps in Learning," pps. 48-52, 1988

16. Enjoying Indiana Birds by Alfred (Bud) Starling
A month-by-month chronicle of 122 species found in Indiana.
Indiana University Press (1978).



EACH AREA HAS IMMEDIATE VALUE AS A LABORATORY IN WHICH CHILDREN CAN OBSERVE STAGES OF SUCCESSION IN PLANT GROWTH AND ANIMAL POPULATIONS

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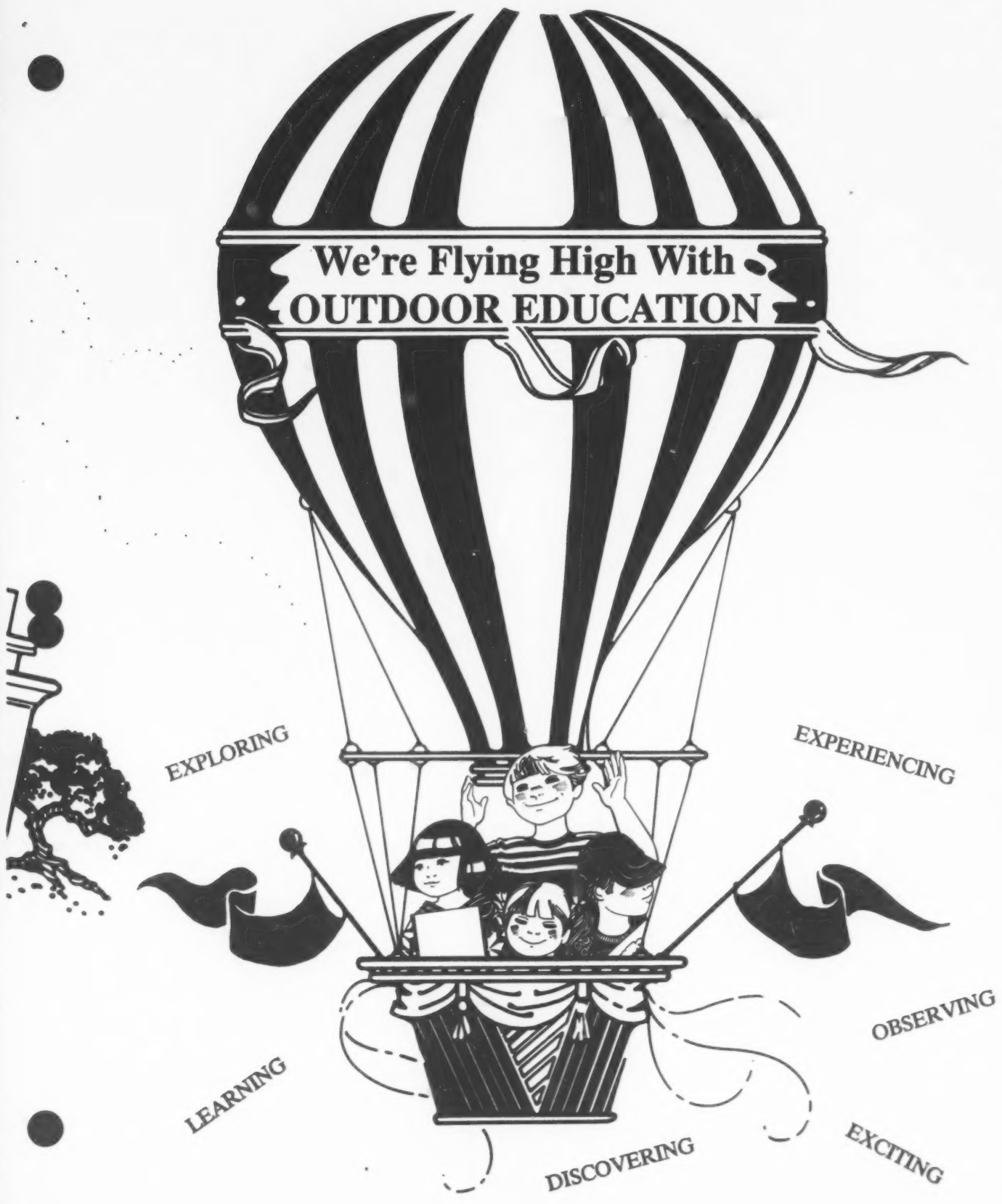

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